The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIII, No. 23 CHICAGO November 6, 1920

EDITORIAL DEPARTMENT—
Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor

BUSINESS DEPARTMENT—
Geo. P. Miller, Manager.

EASTERN OFFICE—
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C. O. Nelson, Secretary.

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Big Road Job Completed on Time

K. E. Lancet, Indiana's Assistant Highway Engineer, complimented The Cunningham Construction Company because it completed an 8-mile stretch of highway on time.

The road, near Coatesville, Indiana, was 18 ft. wide, six inches thick at the shoulders and eight inches thick in center,---honestly built within both time and material specifications.

Three husky PLYMOUTH Gasoline Locomotives played a big part. They kept a hundred batch boxes constantly on the move, and the big cement ribbon crept along at the rate of 500 feet daily.

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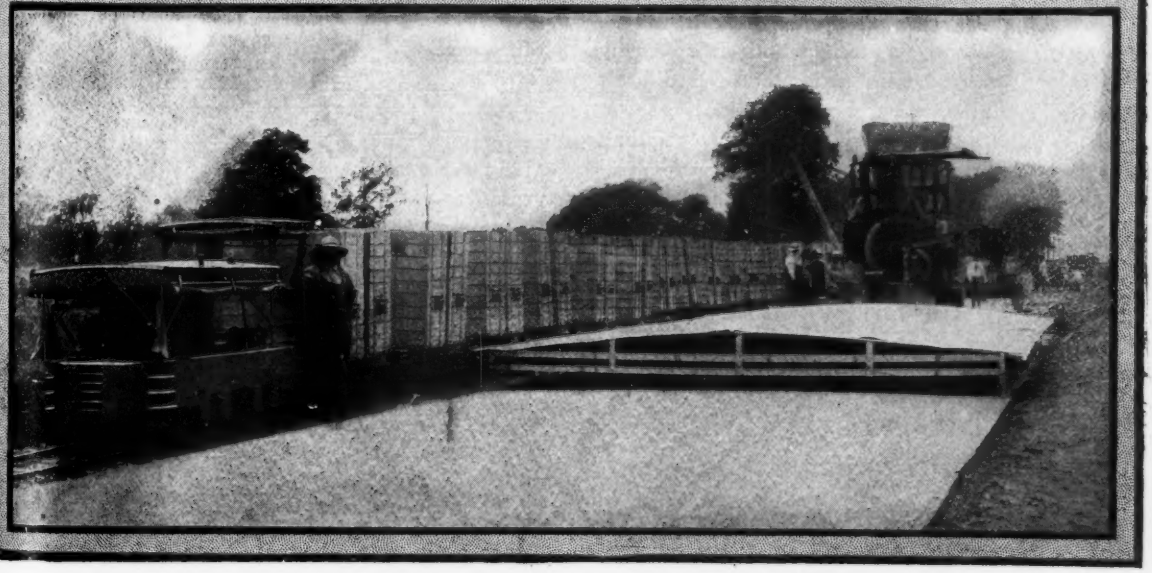

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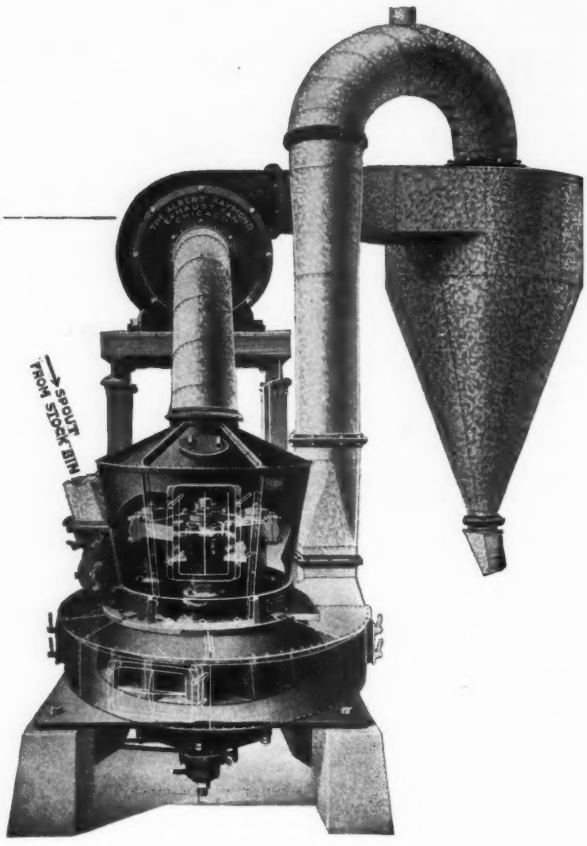

Raymond Roller Mills and Automatic Pulverizers Equipped

with Air-Separation are used to reduce so many materials and in so many diversified industries that it is difficult to cite a sufficiently general case to illustrate to every one having a grinding problem, that the Raymond System will give the results desired and with an economy that can be reached in no other way.

If you have a grinding problem of any kind what-so-ever, write us your requirements as our engineers will gladly give you the benefit of our forty years' experience in the grinding field.

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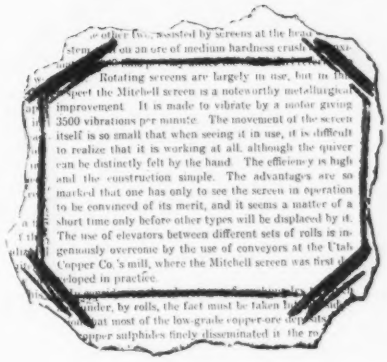
As an Australian Authority
— Views the —
MITCHELL ELECTRIC VIBRATING SCREEN

"It seems a matter of only a short time when other types will be replaced by it."

The Mining & Scientific Press reprints in its issue of September 18 an article from "Chemical Engineering and Mining Review," published at Melbourne, Australia, an article entitled "The Treatment of American Low Grade Copper Ores."



Rotating screens are largely in use, but in respect the Mitchell screen is a noteworthy metallurgical improvement. It is made to vibrate by a motor giving 3500 vibrations per minute. The movement of the screen itself is so small that when seeing it in use, it is difficult to realize that it is working at all, although the quiver can be distinctly felt by the hand. The efficiency is high and the construction simple. The advantages are so marked that one has only to see the screen in operation to be convinced of its merit, and it seems a matter of a short time only before other types will be displaced by it. The use of elevators between different sets of rolls is ingenuously overcome by the use of conveyors at the Utah Copper Co.'s mill, where the Mitchell screen was first developed in practice.

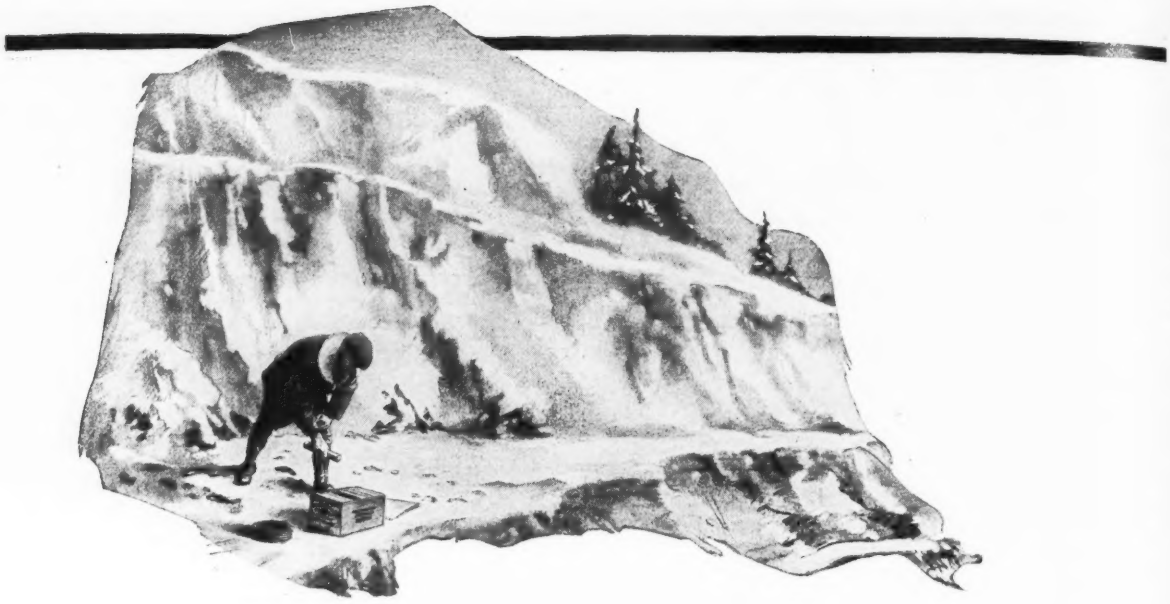
The treatise describes the various methods employed in mining and milling low grade copper ore in the United States. One of the most important processes is that of screening the ore in the mill. The paragraph on this subject is reproduced in facsimile here.

This tribute to the Mitchell is one that is being repeated by **experts in eight different industries.** What the Mitchell has done in screening ore it is also doing in screening fertilizer, salt, sand, gravel, sugar, rice, grain, coke and coal.

No matter what your screening requirements may be, it will be worth your while to write for full information regarding the Mitchell

Stimpson Equipment Company

315 Felt Building **Salt Lake City, Utah**



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THE present-day low-freezing ammonia and gelatin dynamites were originated by the Du Pont Company and carried to their present highly efficient state in the Du Pont Laboratories.

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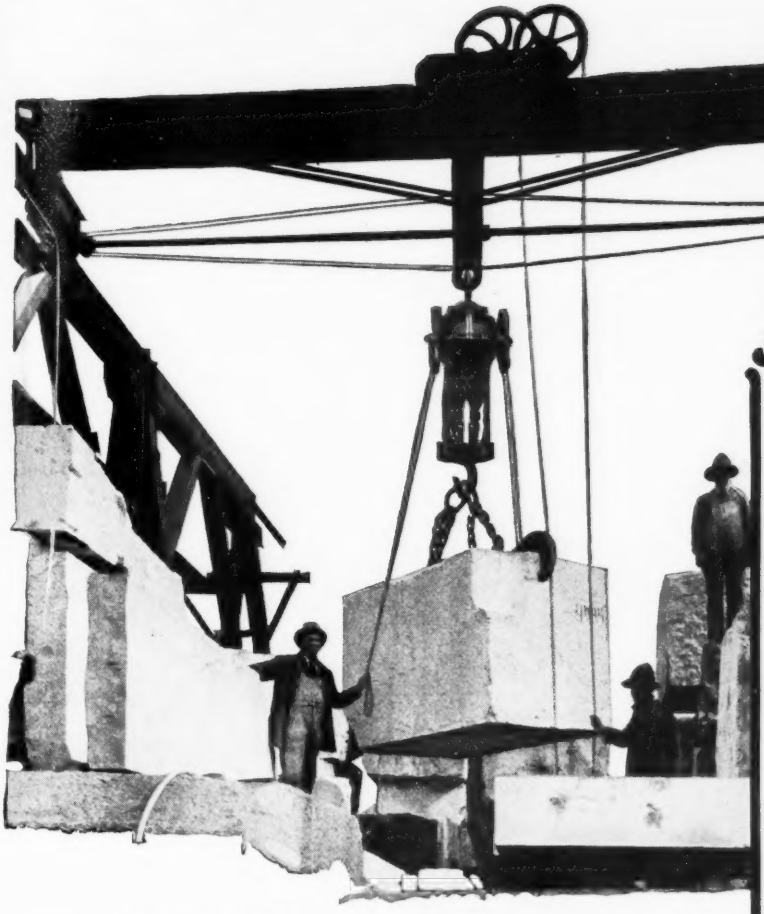

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MAKING heavy loads lighter—two men lift a 15-ton stone with a "Cyclone" Hoist.

The handling of any load up to 40-tons in quarry, yard or shop is made easy by the use of "Cyclone" Hoists, with "C-M" Traveling Cranes or "Matchless" Trolleys.

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No matter what size work you handle (up to 40-tons), a "C-M" outfit can be economically installed that will handle it easily, quickly and safely, and show big savings over hand labor. In many cases such an outfit will pay for itself in a month.

Let's get together and see if we can't work out an installation that will materially increase your profits by speeding up your work and reducing costs. Our forty years experience is at your service for the asking.

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Start a small plant of this kind—the expense is small and it will not require much work to introduce the product.

"Crescent" Foot Lever Tamping Brick Machines have a capacity of from 5,000 to 6,000 brick a day.

"Crescent" Power Brick Machines tamp individually 12,000 brick a day.

Write for Bulletin No. 50 for Further Information. We Have "Crescent" Machines Ready for Shipment

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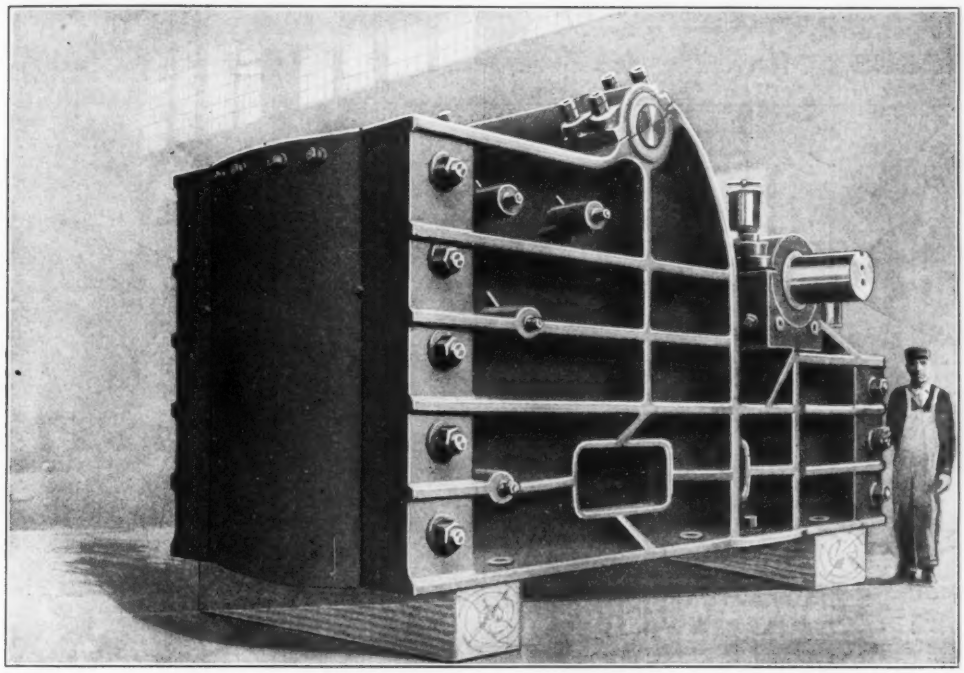
When YOU Think of Buchanan-Think of Crushers

TEXAS TRAP ROCK *and*



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ALL STEEL PATENTED

When the two get together new Texas crushing records are made. The installation of a 40x42-in. Buchanan all steel Jaw Crusher at the Knippa, Texas, plant of the Texas Trap Rock Co. is another notable example of the dependability and efficiency of these crushers. Feeds directly to a 30-in. belt conveyor.

The quarry is a large face of extremely hard and tough trap rock that calls for a massive, rugged crusher, and after a survey of the field a Buchanan was selected largely because of its all steel construction and known ability to do the hardest kind of work at low cost.

Let us help you arrive at the best size and type of Buchanan Crusher for your work—24 sizes, from 66-in. by 84-in. to 24-in. by 36-in.

We will send catalogs. Write us

C. G. BUCHANAN CO., Inc.

90 West Street **New York**

Crushing Machinery, Crushing Rolls and Magnetic Separators

When You Think of Crushers-Think of Buchanan

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

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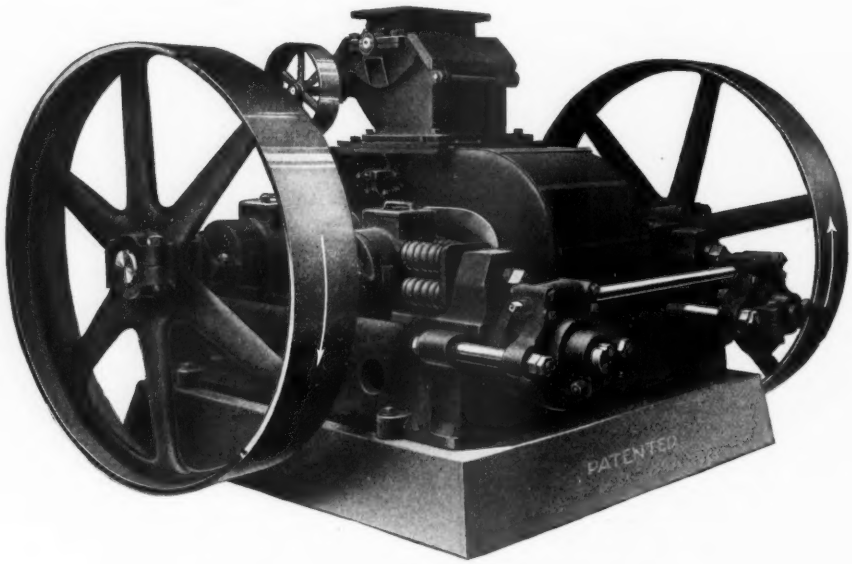

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Strong, Massive Machines, Built to Withstand Hardest Usage, Such as Crushing Hardest Ores, Emery, Alundum, Corundum, and Other Hard Materials

RUN WITH ONE-QUARTER THE CRUSHING SHOCKS OF OTHERS

Because the springs back of **all four** bearings allow the rolls to spring back in relief, **equally** and **oppositely,** thus balancing each other and **QUARTERING** the usual crushing shocks common to such machines.

Sizes: 8x5, 12x12, 16x10, 20x14, 22x14, 24x15, 30x16, 32x16, 36x20, 38x20.

STURTEVANT MILL CO., BOSTON MASS.

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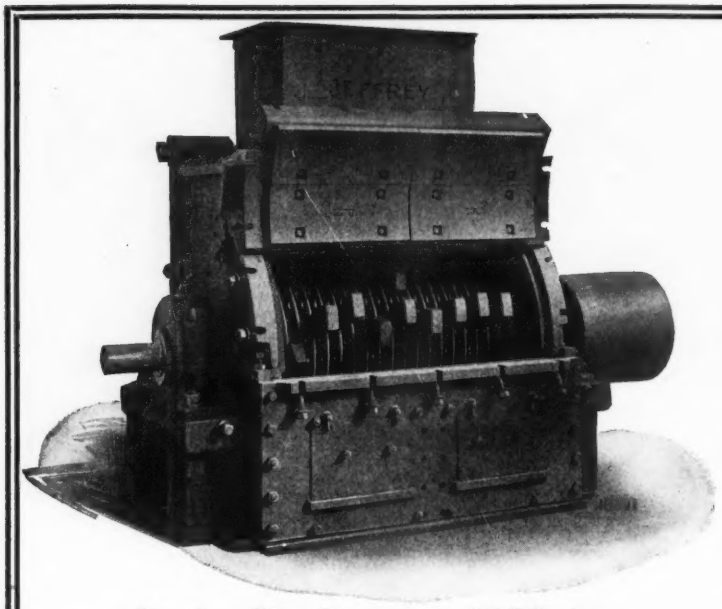
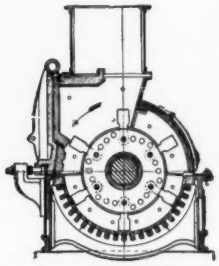


Note: Accessibility, Compactness and Ball Bearings



Sectional View of Pulverizer Showing Top Feed

Jeffrey TYPE "B" Ball Bearing Swing Hammer Pulverizer

for Breakdown of Large Pieces of Limestone, Gypsum, Shale, etc.

Leading Cement Mills, Lime Plants, Quarries, Gypsum Plants, etc., are being equipped with Jeffrey Swing Hammer Pulverizers to meet the constantly increasing demands.

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And even the originally accepted materials are frequently handled more cheaply in rotary kilns than by the older processes.

You may be able to effect some substantial savings by the installation of VULCAN Rotary Kilns.

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Established 1849

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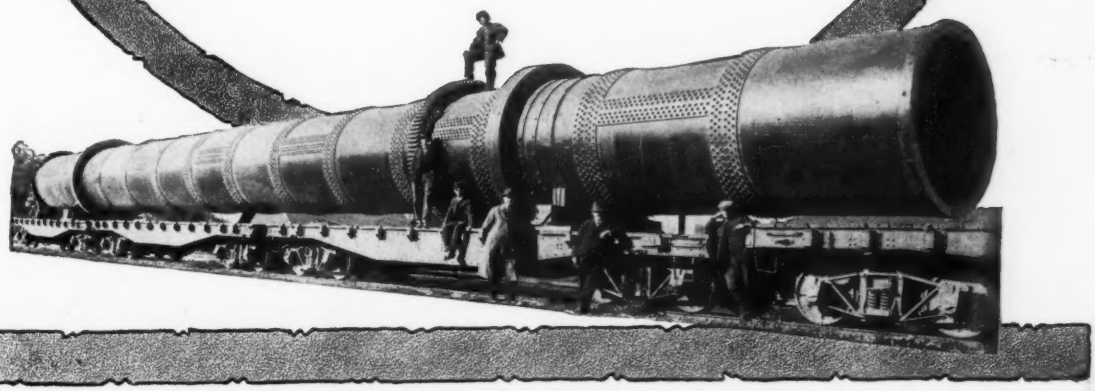

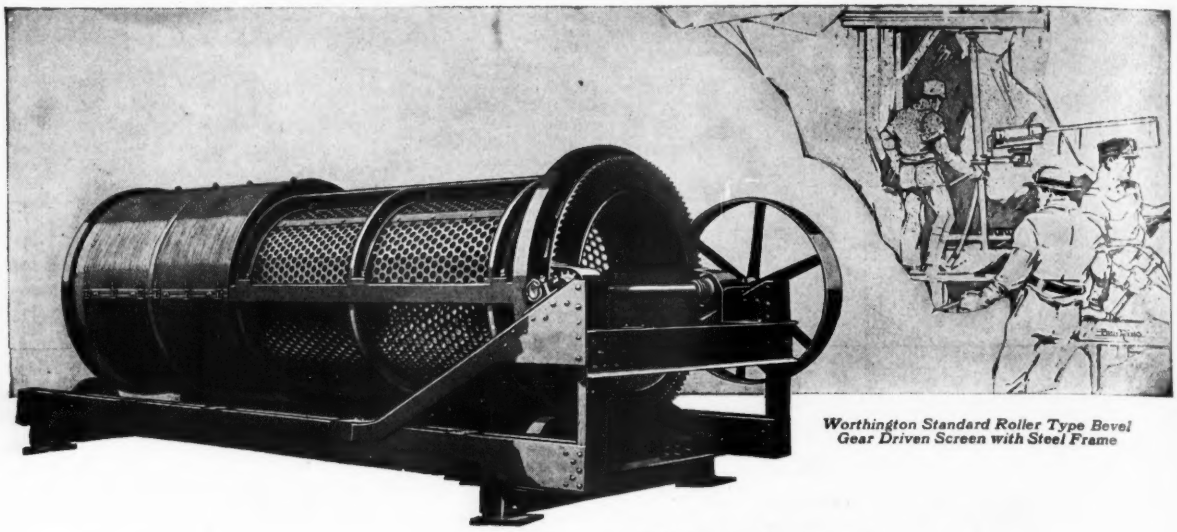

Worthington Standard Roller Type Bevel Gear Driven Screen with Steel Frame

What Worthington have to offer you

SINCE proper selection and installation of machinery determine plant efficiency, Worthington maintain at their Power and Mining Works, Cudahy, Wis., a corps of engineering experts for your advice and help.

As companion apparatus to the Screen illustrated at the head of this page, Worthington build Superior McCully Gyratory Crushers, Superior Jaw Crushers, Rotary Kilns, Dryers, Coolers, Elevators, Tube Mills and Ball Compartment Mills. Many of these machines incorporate particular Worthington construction features as for instance, Superior McCully suspended short shaft and force-feed lubrication.

Then too, sponsoring these machines is the great, big Worthington organization since 1840 world's standard for pumps and pumping machinery.

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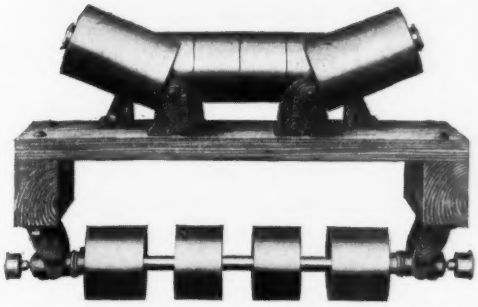
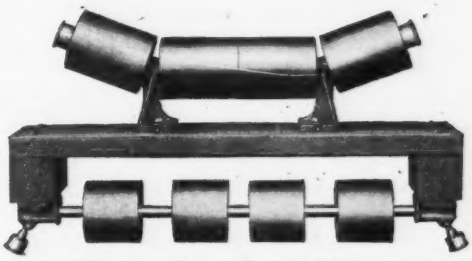
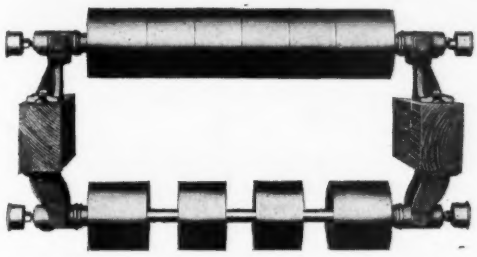


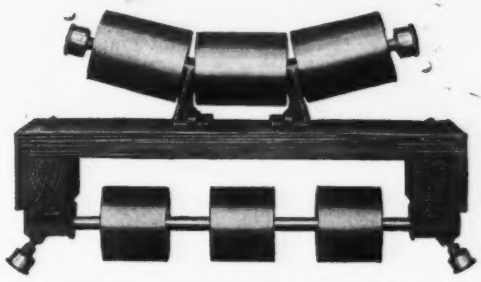
Style "C" Main Adjustable Troughing Roller with 10°, 15° and 20° Trough. Style "R" Main Return Roller



Style "A" Main Troughing Roller with 20° Trough for 20" to 24" belts. Style "S" Main Return Roller



Style "E" Main Flat Carrying Roller. Style "R" Main Return Roller



Style "A" Main Troughing Rollers with 15° Trough for 12" to 14" belt, and 15° or 20° Trough for 16" to 18" belt. Style "S" Main Return Roller

The Right Conveyor Rollers As Important As the Right Belt

Main patented flat-carrying and troughing rollers operate with a minimum of power.

They are exceptionally durable.

They are made in adjustable styles where changing conditions require such a system.

Leviathan-Anaconda Belts with Main Belting Rollers offer the most dependable, economical and successful belt conveyor system known today.

Leviathan-Anaconda Conveyor Systems of large size are in use where the speed of the belt is 600 feet per minute. Even with the narrower belts speeds of 300 feet a minute are not uncommon without danger of spilling the material carried.

Remember that every Leviathan-Anaconda Conveyor System is designed expressly to meet your individual plant conditions. Some of the most important manufacturing plants in America are numbered among our customers and of these many found belt conveyors satisfactory only when they at last tried Leviathan-Anaconda Belts mounted with Main Belting Rollers and backed by our engineering service.

If you are struggling with inefficient, scarce and high-priced common labor and do not know the possibilities of a Leviathan-Anaconda Conveyor System in your plant, write for our booklet—"Conveyor Problems and Their Solution."

LEVIATHAN AND ANACONDA GUARANTEED AGAINST STRETCH BELTING

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DUPLEX TRUCKS

BUILT FOR BUSINESS

Hauling Slag With a Duplex 4-Wheel Drive

These Duplexes Replaced Two Caterpillar Tractors and Two Makes of Rear Wheel Drive Trucks

THE picture below shows a Duplex 4-Wheel Drive pulling out of a slag pit with a trailer.

In the first demonstration for Axton & Spratlen, Denver, the Duplex 4-Wheel Drive pulled out of the pit with an ordinary wagon attached with a 4-ton load.

It is well known, of course, that a wagon pulls approximately 40% harder than a properly constructed motor truck trailer — yet the Duplex tires showed absolutely no slippage, although the other two trucks in the demonstration showed approximately 80% slippage.

That is to say, 80% of the revolutions of the wheels resulted in no movement of the truck—the wheels getting traction only once in every six revolutions.

Why Is This Duplex 4-Wheel Drive Such an Efficient and Economical Trucking Unit?

In the first place, every wheel is a driving wheel. This principle has consistently proven itself for ten years — for many Duplex 4-Wheel Drive Trucks built ten years ago are still running.

Four driving wheels do actually deliver three times as much as two driving wheels — you can figure this for yourself.

Four driving wheels equalize the strain, reduce the repair bills and utilize the entire weight of the truck as an AID in moving the load.

In two-wheel drive trucks a big part of the weight and load is necessarily dead — that is, it represents a problem of overcoming the inertia of mere dead weight.

The Duplex 4-Wheel Drive can take you over roads with loads that no two-wheel drive truck can possibly negotiate no matter how good a truck of its kind it may be.

Any Duplex Dealer Will Demonstrate the Duplex 4-Wheel Drive for You

Get the facts. Go to the Duplex Dealer near you. Arrange for a demonstration between the Duplex and any other truck that you may think is a good one. If the superior performance of the Duplex doesn't convince you, then do not buy it.

You want facts—truck facts—not theory. The Duplex Dealer can show you where this is the most economical truck for heavy duty ever made — it saves you oil, gasoline, tires, repair bills and time—and the dealer can prove it.

The Duplex 4-Wheel Drive is 3½ ton capacity, price $4250, f. o. b. Lansing.

DUPLEX BUILT FOR BUSINESS

For high speed hauling, the world's record Duplex Limited, Medium Capacity, Pneumatic Tires, Full Electrical Equipment, is as good in its field as the Duplex 4-Wheel Drive is in the heavy duty field. Price, $2575, f. o. b. Lansing

DUPLEX BUILT FOR BUSINESS

Duplex Truck Company

Lansing • Michigan

One of the Oldest and Most Successful Truck Companies in America

Can You Afford to Waste Labor?

Have you ever taken time to figure up what it costs you to handle materials by hand? Or have you compared your hand handling costs with those of a user of a locomotive crane? Present labor problems have led many concerns to make this test. And they are surprised to learn that they have wasted labor for so long when a locomotive crane would have done the work better and more economically.

Present labor conditions are the cause for the purchase of many Brownhoists in a growing number of industries. But, once used, the Brownhoist owner seldom goes back to his old handling methods, as he has a machine he can depend on for all kinds of steady service. And it is not only dependable, but more economical than the labor which he used to think indispensable.

For handling bulk or bar materials, sling loads, or scrap and castings by magnet the Brownhoist is proving itself a time and money saver in many different lines of business. There are types and sizes of Brownhoists to fit in to nearly every handling need. Catalog K shows some of these cranes at work. Write for a copy.

BROWNHOIST

Products include:

Locomotive Cranes
Grab Buckets
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Electric Hoists
Tramrails and Trolleys
Overhead Tr. Cranes
Pillar and Jib Cranes
Heavy Dock Machinery
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The Brown Hoisting Machinery Company

40 Years in Crane Business **Cleveland, Ohio, U. S. A.**

Engineers and Manufacturers of Heavy Dock Machinery
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When writing advertisers please mention ROCK PRODUCTS

Some Interesting Results with Telsmith Reduction Crushers—

NO. 2 TELSMITH REDUCTION CRUSHER—Maximum size of feed, 4½ in. cubes; minimum discharge opening, ½ in.; size of motor recommended, 20 H.P.; net weight, 13,600 lbs.; size of driving pulley, 36 in. x 12 in.; speed of driving pulley, 400 R.P.M.; hourly capacity with ¾-in. discharge opening, 12-16 tons; screen analysis on tough, close-grained black trap rock with 11/16 in. discharge opening (using Tyler's standard testing sieves) as follows: Retained on 1.05 in. opening, 3%; on .742 in. opening, 6.1%; on .525 in. opening, 15.1%; on .371 in. opening, 18.2%; on .263 in. opening, 12.1%; on .093 in. opening, 24.2%; on .046 in. opening, 7.6%; thru .046 in. opening, 13.7%.

The Telsmith Reduction Crusher is specially designed for re-crushing coarse rock to ¼-in. —1½-in. sizes. The smaller machine, known as the No. 2, is built to follow a No. 4, 5 or 6 gyratory breaker or a jaw crusher up to 14x 28-in. size. The data sheets, reproduced herewith, are based on actual measured capacities, ampmeter and screen tests.

NO. 4 TELSMITH REDUCTION CRUSHER—Maximum size of feed, 7 in. cubes; minimum discharge opening, ¾ in.; size of motor recommended, 50 H.P.; net weight, 45,000 lbs.; size of pulley, 275 R.P.M.; capacity per hour with ¾-in. bottom opening, 50-60 tons; screen analysis on hard Wisconsin granite with 15/16 in. bottom opening (using Tyler's standard testing sieves) as follows: Retained on 1.05 in. opening, 12.5%; on .742 in. opening, 25.3%; on .525 in. opening, 22.8% on .371 in. opening, 10.9%; on .263 in. opening, 8%; on .093 in. opening, 9.5%; on .046 in. opening, 6.2%; thru .046 in. opening, 4.8%.

The No. 4 Telsmith Reduction Crusher (as shown in the picture below) is a massive re-crusher, built to follow a No. 8, 9 or 10 gyratory or a jaw crusher, up to 36x48-in. feed opening. It has a feed hopper big enough to take a gravity feed of coarse rock without hand or mechanical feed regulation.

Both machines produce their best results when choke-fed with a big column of rock above the crusher. Both discharge by gravity without centrifugal action. The crusher structure is short and heavy; the shaft rigid and absolutely unbreakable. The bearings are of large area with automatic lubrication. Glad to send you bulletin No. 2 F 11 (Telsmith Reduction Crusher) and catalog No. 166 (Telsmith Primary Breaker).

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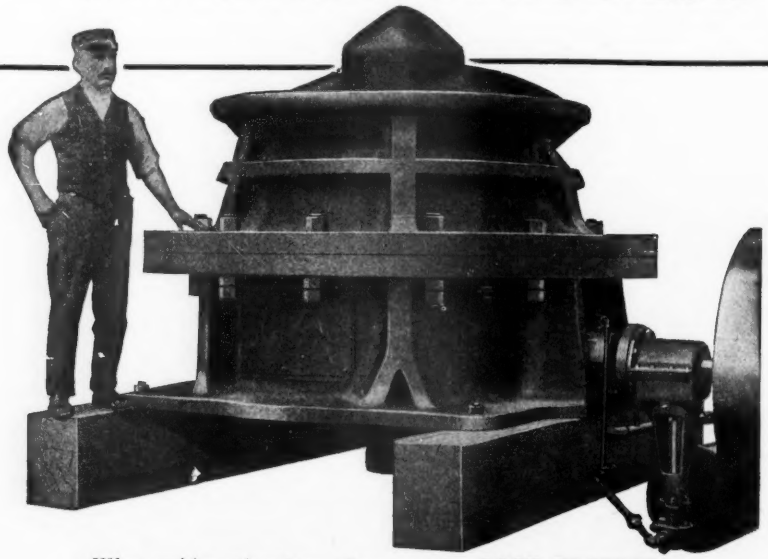
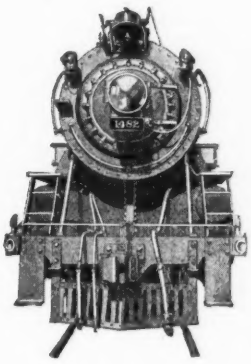


BALDWIN

KEEP EVERY LOCOMOTIVE WORKING

FOR some time to come the demand by every branch of industry for additional motive power will be greater than it will be physically possible to supply.



Even under these conditions, an increasing amount of freight must be moved, and this can only be done by keeping every locomotive now in existence in working condition, and by avoiding delays in making repairs.

Every Baldwin Locomotive is built to gauges and templets, providing for like parts fitting accurately in all engines of duplicate design. This interchangeability of parts reduces to a minimum the cost of repairs and the delays incident to making them.

Keep your store room well supplied with duplicate and repair parts, and thus be prepared for any break-down in your present motive power.

THE BALDWIN LOCOMOTIVE WORKS
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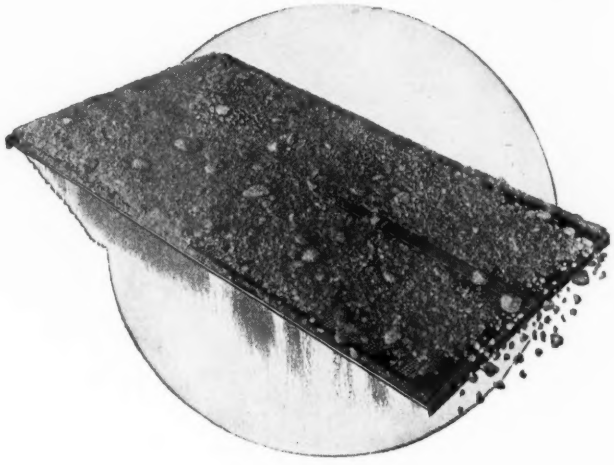
LOCOMOTIVES

HUM-MER INCLINED SCREEN

Applies Electro-Magnetic Vibration to a "Drumhead" Tension Screen



A FEW PROMINENT USERS
OF *HUM-MER* SCREENS

Bethlehem Steel Co.
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Arizona Copper Co., Ltd.
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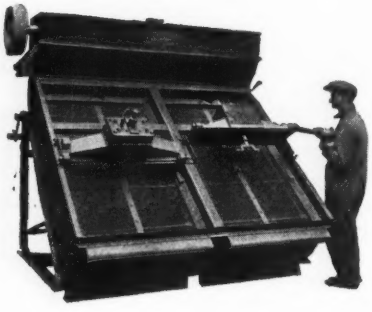
Diamond Alkali Co.

"Makes wire cloth screen faster and wear longer"



SIMPLICITY *and* SPEED!

THE mechanical simplicity and rapid screening of the HUM-MER is a combination that reduces the operating and maintenance costs and greatly increases the profits of screening.

The taut screen cloth is vibrated by a powerful electro-magnet which requires no lubrication. The intensity of the vibration can be adjusted to any load on the screen or to suit any character or size of material. This adjustment is made by simply turning the hand-wheel at the top of the vibrator.

This powerful vibration, adjusted in intensity to the particular material being screened, results in a sorting action and speed of production not approached by any other screening device.

INVESTIGATE WHAT THE HUM-MER WOULD DO ON YOUR MATERIAL

Catalogue No. 42-R sent upon request

THE W. S. TYLER COMPANY, *Cleveland, Ohio*

Manufacturers of Woven Wire Screens and Screening Equipment

Rock Products

Vol. XXIII Chicago, November 6, 1920 No. 23

Silica Sand Quarry Which Became a Gravel Proposition

Summit Silica Company of Barberton, Ohio, Has Unusual Silica Deposit Requiring Many Special Operating Features

A SILICA SAND DEPOSIT covering an area of over 65 acres, which is half rock and half gravel, and where the gravel is really the valuable product, because of its sharp, clean grain, and high percentage of silica (in this case 99 per cent) is certainly an unusual one. And to develop an unusual deposit requires an unusual plant, and such is the Summit Silica Co., of Barberton, Ohio. The plant which has just lately been rebuilt, because of a fire which practically destroyed the whole of the old plant, is modern in every respect, and its methods are certainly worth investigation.

Quarry Deposit and Operation

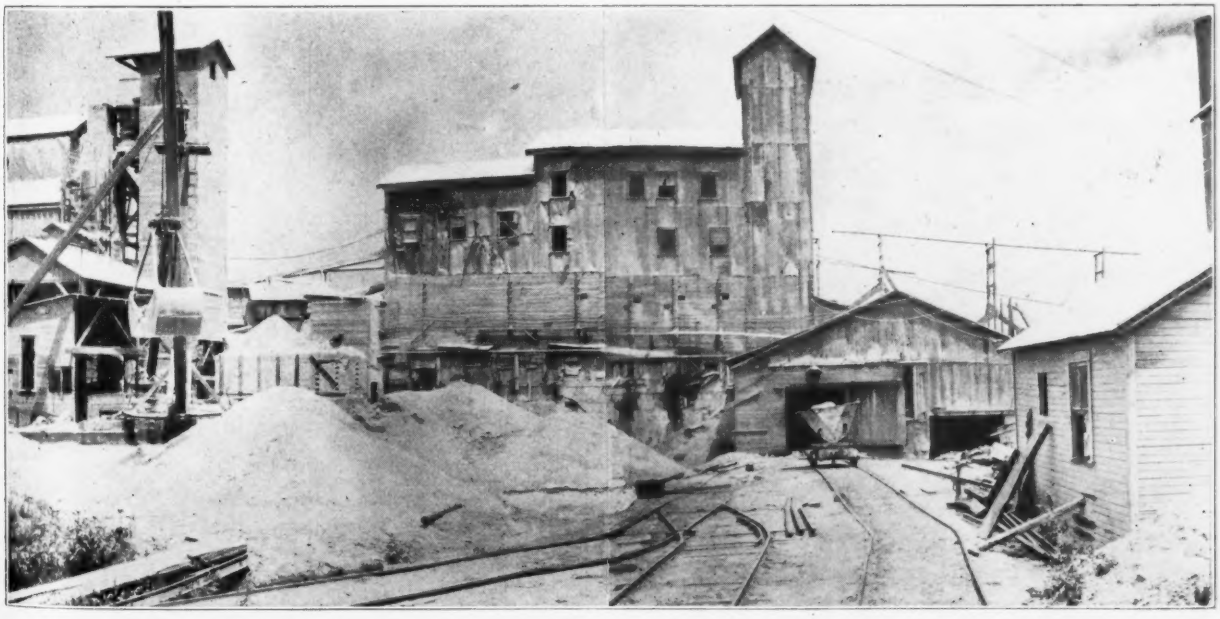
The present quarry is being worked in a crescent shape and the face is about 1500 ft. long, and about 45 ft. high. Surmounting this is about 8 ft. of overburden, consisting of loam, clay, etc., which is very easily removed by a 22-ton traction type steam shovel with a ¾-cu. yd. dipper. Beneath the present level of the quarry floor is a hard ganister rock, which is in demand for refractory purposes and this also tends to increase the value of the deposit.

Because of the fact that the deposit is 50 per cent gravel, drilling and blasting is a very difficult proposition. A well drill is now used for blast holing, but it is the opinion of many that the Western method of tunneling or "coyote holes" would be the logical thing here. However, the holes are now drilled 12 ft. back from the face and 12 ft. apart without being staggered. Shots take place here about three times a year, 40 per cent dynamite being used and electric blasting caps as detonators. In this case it is only necessary to loosen up the gravel and rock, and the resulting material is suitable for loading.

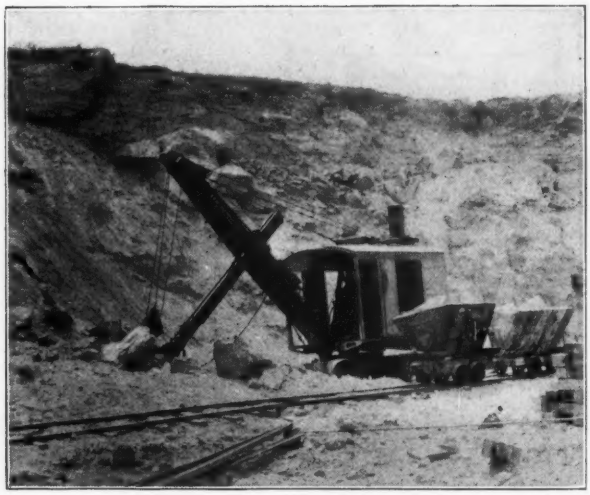
The shattered rock and gravel is loaded by two steam shovels with ¾-cu. yd. dippers into 1¼-cu. yd. side-dump cars of the "V" type, 36-in. gauge. All of the cars used are designed and patented by this company and are made in the company shops. The haul from the face of the quarry to crusher, a distance of about 500 ft., is made by means of a gasoline locomotive, which can haul a 20-ton load very effectively and efficiently.

Crushing Plant

The quarry cars dump into a No. 6 gyratory crusher which is practically on the same level as the quarry floor. As the material is reduced it falls onto a 24-in. belt conveyor which in turn de-

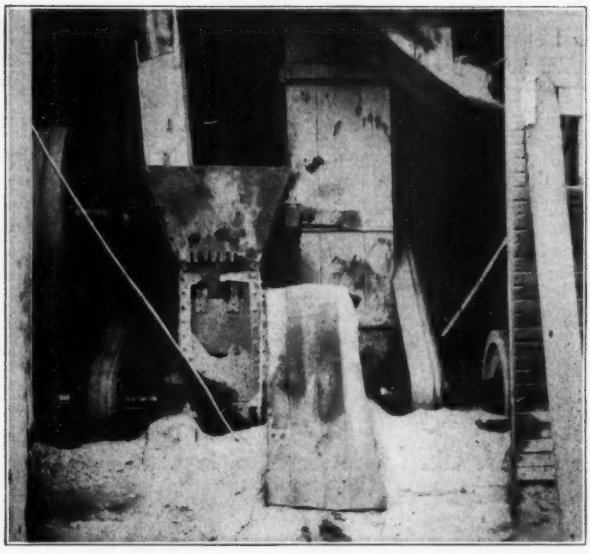


Plant of the Summit Silica Co., Barberton, Ohio; tower at the left is an abandoned tower-type of dryer

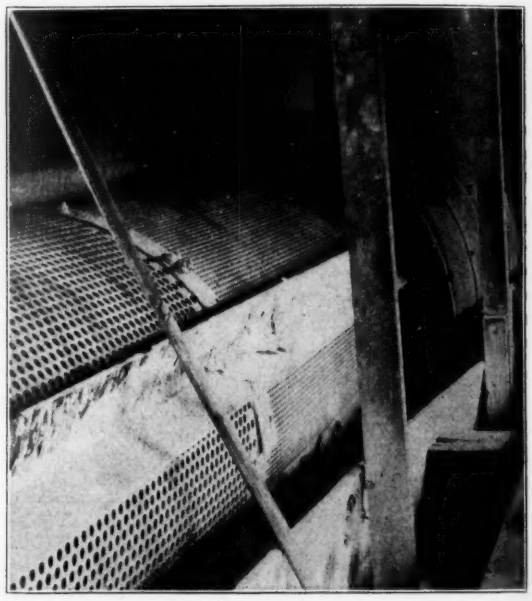


Steam shovel quarry excavator

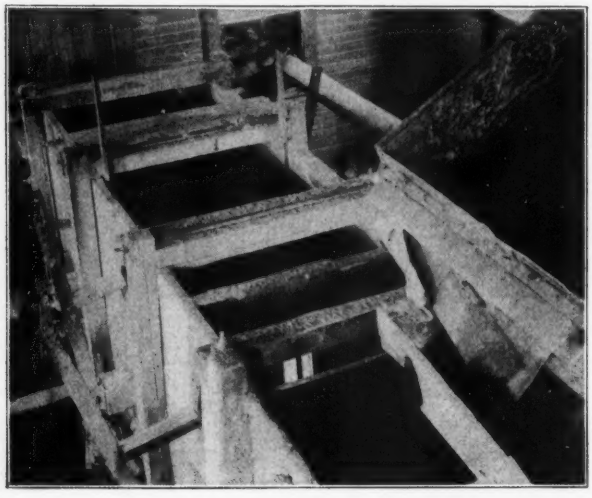
Initial gyratory crusher



Disintegrator or "squirrel-cage" mill



Cylindrical sizing screen for gravel



Flume with partitions or baffles for separating different sizes of sand

Special valves for tapping flume

posits it in the receiving hopper of a 36-in. disintegrator, or squirrel-cage mill, as it is sometimes called. Here the material is ground. Adjoining the disintegrator is an 8x16-in. enclosed bucket elevator of 65 ft. centers, which reclaims the material from the disintegrator and deposits it in the washing screen, or stone scrubber. From here it falls by gravity into a jacketed sizing screen where commercial sizes of gravel are separated.

Washing Plant

The sand from the screen falls into a hopper and then into a long flume where it receives further washing. It is next pumped over to a second flume, which is shown in one of the accompanying views. This flume is divided into five portions, and as the sand comes down the hopper into the flume, the tendency is for the heavy sand to settle first and in this way a coarse grade of sand is secured in the first partition. The lighter sand will float over into the second partition, the next lightest into the third, etc., until the lightest settles in the last partition.

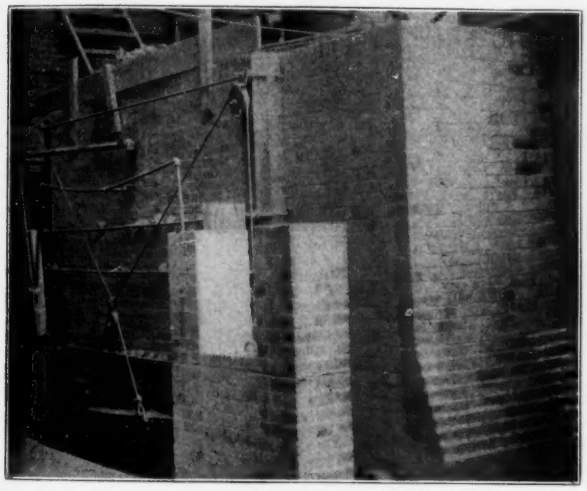
Below the flume are two bins 20 ft. x 18 ft. x 20 ft. into which the sand is emptied from the flumes by means of special lever values, as shown in one of the views. The coarser sand, which comes from the first three partitions is used for steel molding, while the finer sand from the last two partitions is used for gray iron core work, sand blast, etc. The sizing screen mentioned before produces two grades of gravel, the coarser of which is sold for concrete purposes, while the finer is sold for oversize sand blast, terrazzo, etc.

Drying Plant

For those specifying a sand not dried, the company loads its cars on the front part of the building by means of gravity chutes from the bins aforementioned. This also applies to the two grades of gravel. For storage purposes, and drying, the sand is emptied into what might be called the back yard of the plant by gravity chutes also.

The sand is reclaimed from the pile by means of a grab bucket and stiff-leg derrick which deposits the material into a hopper feeding the rotary dryer. Just recently a new rotary dryer has been installed and in order to feed it, the material is thrown on a conveyor belt leading direct to the dryer. Both of these rotary dryers are fired by producer gas, which is made in a producer of the company's own design and manufacture.

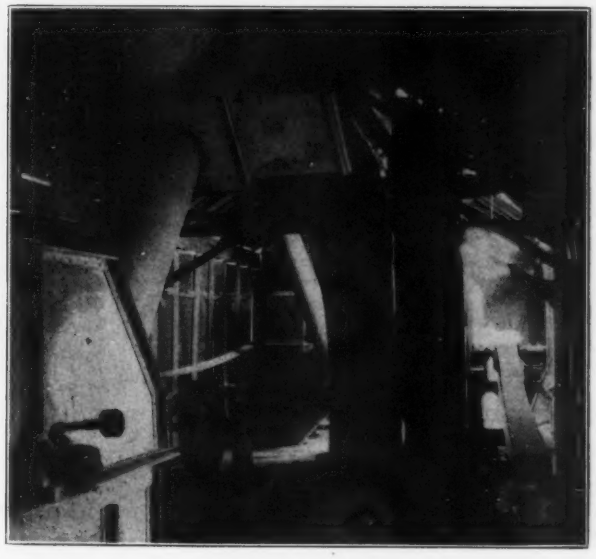
The hot sand falling from both dryers is reclaimed by a 6x24-in. by 30-ft. centers bucket elevators and deposited in the initial scalping screen. The rejections from the screen go to a set of rolls where they are further reduced and are then



Home-made gas producer

Rotary sand dryers

Elevators and spouts to screens



Suction fan fine dust

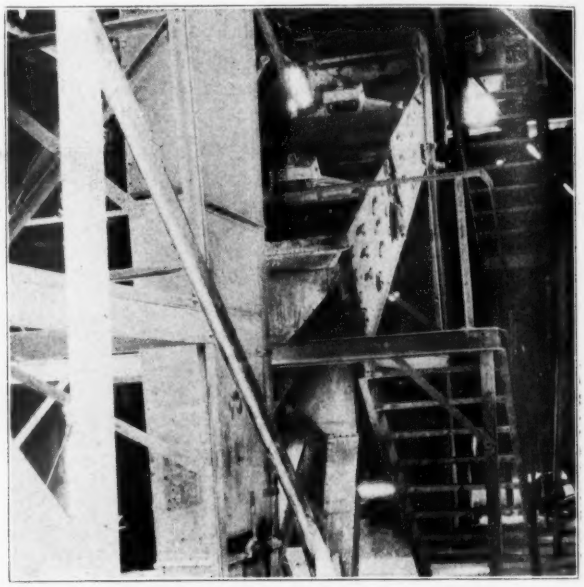
elevated for the final rescreening and separating process.

The room in which the three Tyler "Hummer" screens are located, as can be seen from the accompanying views is of steel and concrete construction, and is absolutely fireproof. The screens are so arranged that they are fed by gravity and work in successive order, and each screen makes four separations. They are constructed entirely of steel and are dust proof. The steel downspouts are provided with baffle plates which are always covered with sand, and in this way form a protective cushion for the material as it comes down the spout, thereby saving steel and repairs. The vibration in the screens is produced by means of a high-speed electro-magnet applied directly to a taut, drumhead tension screening surface, the electro-magnet pulling the screen cloth upwards with a jerk and the alternations in current pulling up and releasing the screen at higher speed.

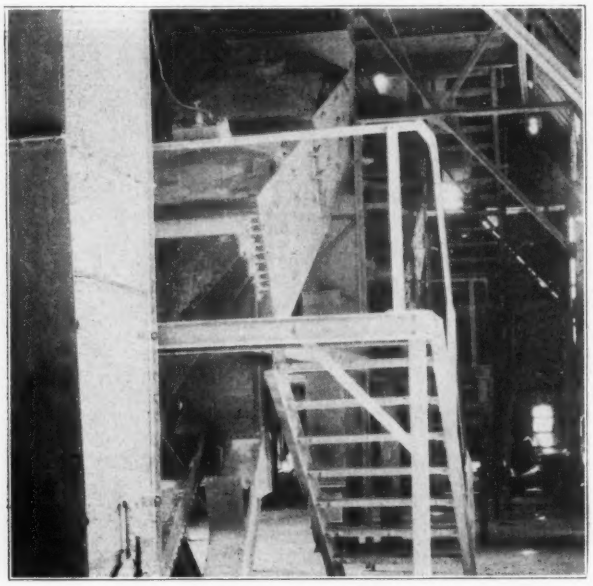
The first screen makes (1) oversize, which goes back to the rolls for regrinding; (2) finished sizes of sand blast, which go to their respective bins by gravity, and one fine sand which is reclaimed by an elevator and deposited for further separation in the second screen. Here three different sizes of sand blast are procured which also go to their respective bins, and the finest sand is again elevated and deposited for further separation in the third screen, where again four separations are made. In the last screen glass sand, steel molding sand, pottery sand, etc., are made.

Connected to each of the screens and to the elevators and rolls are suction pipes which recover the fine dust, and deposit it in a large steel bin. The dust reclaimed is between 100 and 200-mesh and is very suitable for pottery purposes and as a paint filler. For the dried sand there are eight bins in all, each being 20 ft. x 20 ft. x 11 ft., and having a capacity

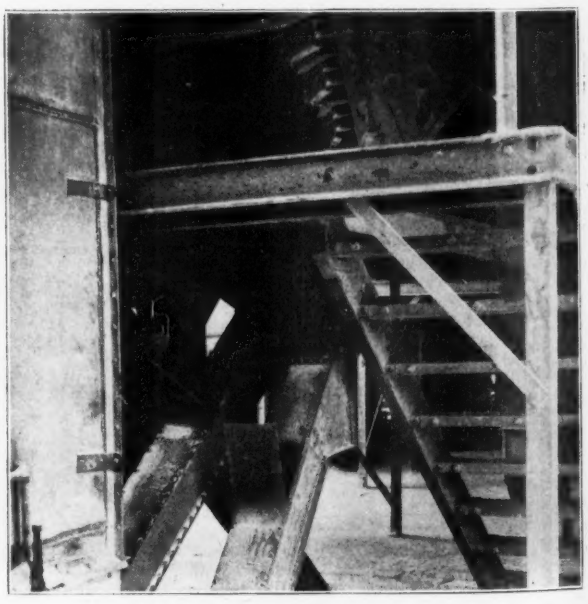
Background—fine dust bin



"Hummer" type vibrating screens



Another view of screens



Discharge spouts of screens

of 150 tons each. They are constructed of reinforced concrete.

Another notable feature in this plant is the method by which cars are loaded with this dry sand. Underneath each bin is a belt conveyor, on which the sand is deposited when it is necessary to fill a car. The conveyor dumps the material into a pit where it is reclaimed by a bucket elevator and deposited into a hopper feeding the downspout to the cars.

The entire drying and screening plant is operated by a unit system of electric motors, while the washing plant is operated by both steam and electricity. The quarry is drained by means of an electrically driven centrifugal pump of 600 gal. capacity. A new air compressor rated at 150 cu. ft. of air per minute has recently been installed, being electrically driven also. The plant has a capacity of about 500 tons per day and 30 men are employed in quarry and plant. Completing the equipment are thoroughly equipped shops and store room.

Personnel

The Summit Silica Co. is a subsidiary of the Otis Steel Co., of Cleveland, Ohio, of which the officers are as follows: George Bartol, pres.; P. J. Wilson, vice-pres.; Geo. A. Paine, sec'y.-treas., and J. E. Ruch, general manager of the plant. R. M. Reine is superintendent.

The Part of Micro-Organisms and Lime in Soil Chemistry

EXPERIMENTS by Wright in California on the decomposition of soil minerals by bacteria indicate that the acid produced by bacteria, carbonic acid, is responsible for the solvent effects on minerals, and it is the opinion that bacteria are, therefore, concerned in the supply of available minerals to plants.

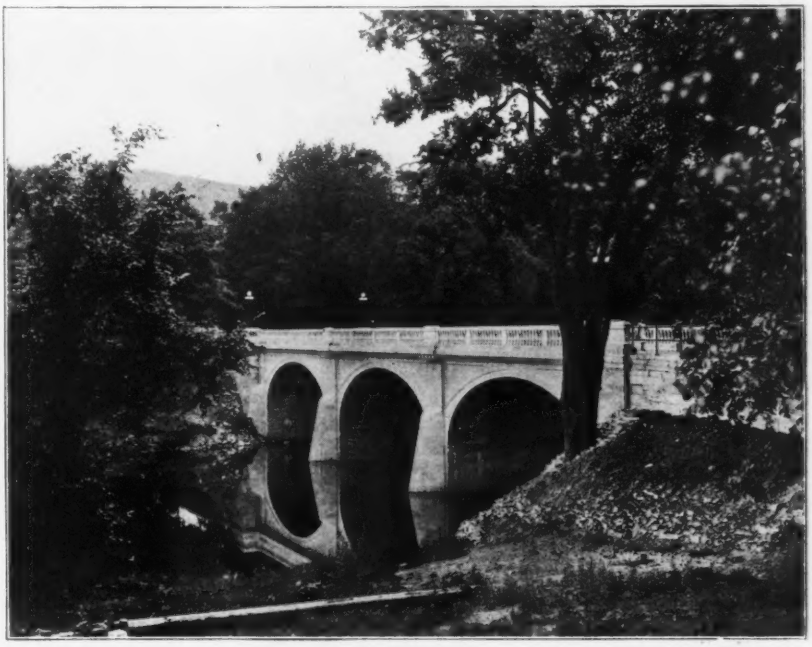
Some investigators, including Dr. McIntire of the University of Tennessee, contend that lime has no effect in helping to render other minerals in the soil available for plant food. Dr. McIntire's conclusions are apparently based on an absence of chemical reactions in laboratory samples, which probably accounts for the fact that he got negative results, while many practical agriculturists firmly believe, from experience in growing crops, that lime does help to release other mineral elements in the soil for plant food.

The difference between laboratory results and field results is probably accounted for by the fact that in the field the soil bacteria had free play, and according to the California experiments, they are the underlying cause of the chemical activity which accompanies their presence in the soil. These bacteria, in a soil rich in calcium carbonate (limestone) undoubtedly set free some of the carbon dioxide or carbonic acid gas (CO_2) which with water acts upon other mineral compounds of the soil, converting them into salts for absorption by the plant.

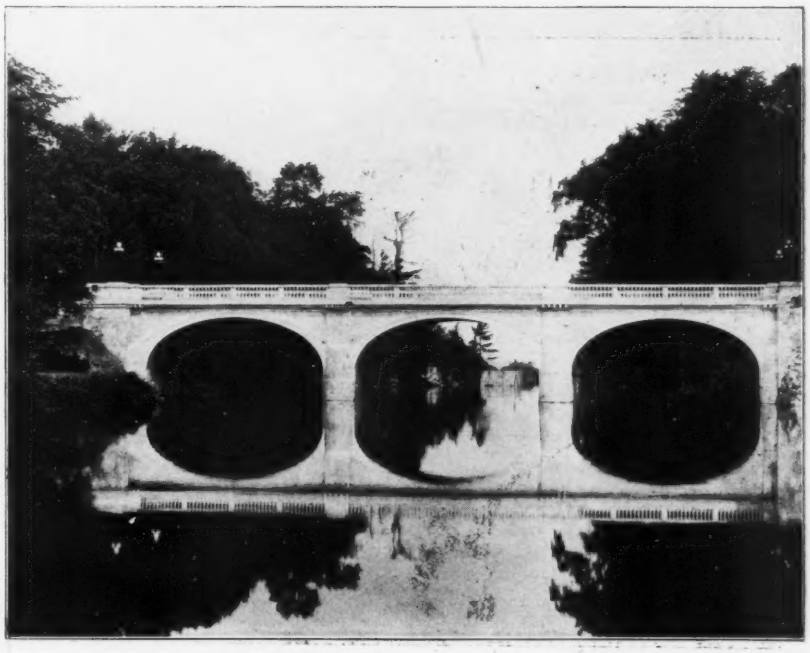
A Pleasing "Rock Product"—White Marble Bridge

THE ACCOMPANYING views show a "rock product" of an unusual kind—a highway bridge constructed chiefly of polished white marble. While the arches and interior masonry are of concrete, the faces and railing are of nearly pure white Vermont marble from the quarries of the Vermont Marble Co., Proctor, Vt.

This bridge is interesting and attractive in itself, but it is more than that, for it typifies what this quarry company has done and is doing for the community in which it is located. It typifies a class of welfare work which helps to keep its employes contented and loyal boosters for marble, not to mention the pleasing effect on casual visitors to the immense quarries and marble-working plants in this vicinity. Other welfare work of this company includes the support of excellent schools, an employees' club house, and dwelling houses in keeping with these.



White marble bridge at Proctor, Vt.



Another view, giving an idea of the setting

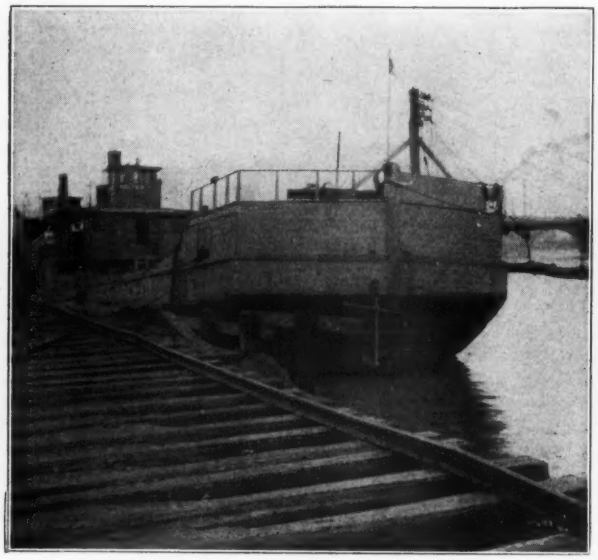
Lake Erie Sand Operations

Methods Employed by Toledo Builders Supply Company and Other Successful Ohio Operators

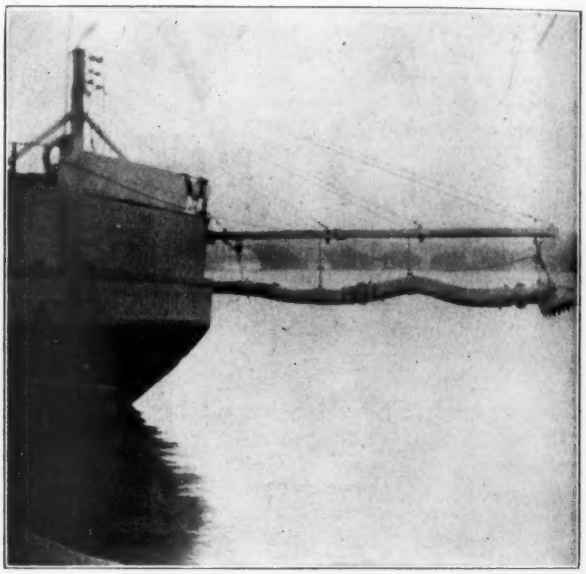
ONE visiting the waterfront of Toledo, Sandusky, Cleveland, and other Lake Erie points cannot help being impressed by the importance of the sand and gravel industries there. Practically all the sand and gravel in Toledo is dredged from the Maumee Bay and River, while in Sandusky and Cleveland a good percentage comes from Lake Erie.

The Toledo Builders Supply Co., is one of the largest operators in the Maumee Bay and River and its operations are typical of the rest which include such operators as the Kelly Island Lime and Transport Co., the DeVille Lake Sand and Gravel Co., the Home-Gardner Sand Co., and the Acme Coal and Builders Supply Co.

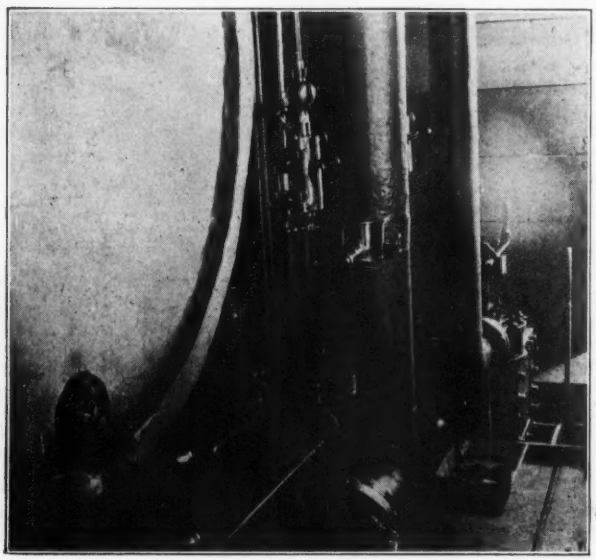
The Toledo Builders Supply Co., operates four sand dredges with an average capacity of 600 tons each. These boats operate under their own power, and regular daily pumping trips are made. Each boat has a crew of six men, including the captain, and living quarters are provided for on the boat. There is of course a cook on board, and a dining room where



Maumee Bay sand and gravel sucker



Suction intake of a typical dredge



Dredge boiler and pumping unit

Sluiceway and screening arrangement

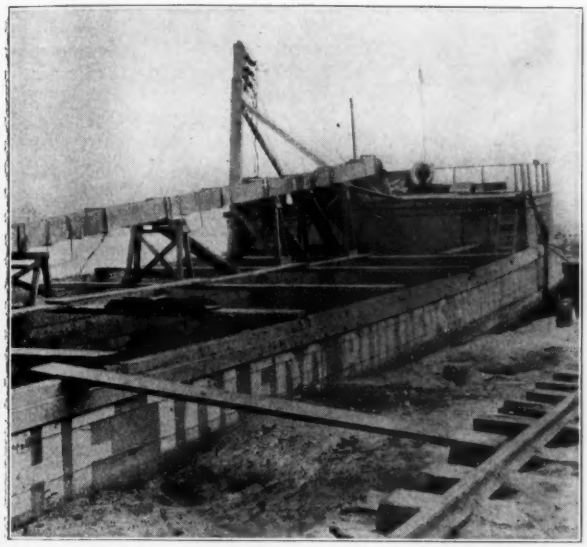
the men are served their meals.

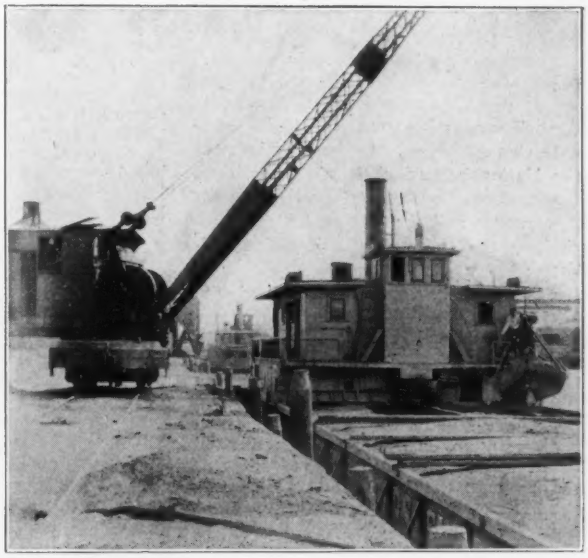
The power for the 75-h.p., 10-in. manganese steel lined centrifugal pump is furnished by steam generated in a 100-h.p. marine boiler. A boiler pressure of 125 lb. is always maintained here. A 15-h.p. hoisting engine is also operated by steam, from this same boiler. It is used to raise and lower the suction nozzle, which is shown in one of the accompanying views. There is 38 ft. of suction hose which is attached to the boom on the side of the boat, by means of cables passing through blocks and sheaves. The mouth of the suction nozzle has saw teeth, so as to insure a good grip on the bottom.

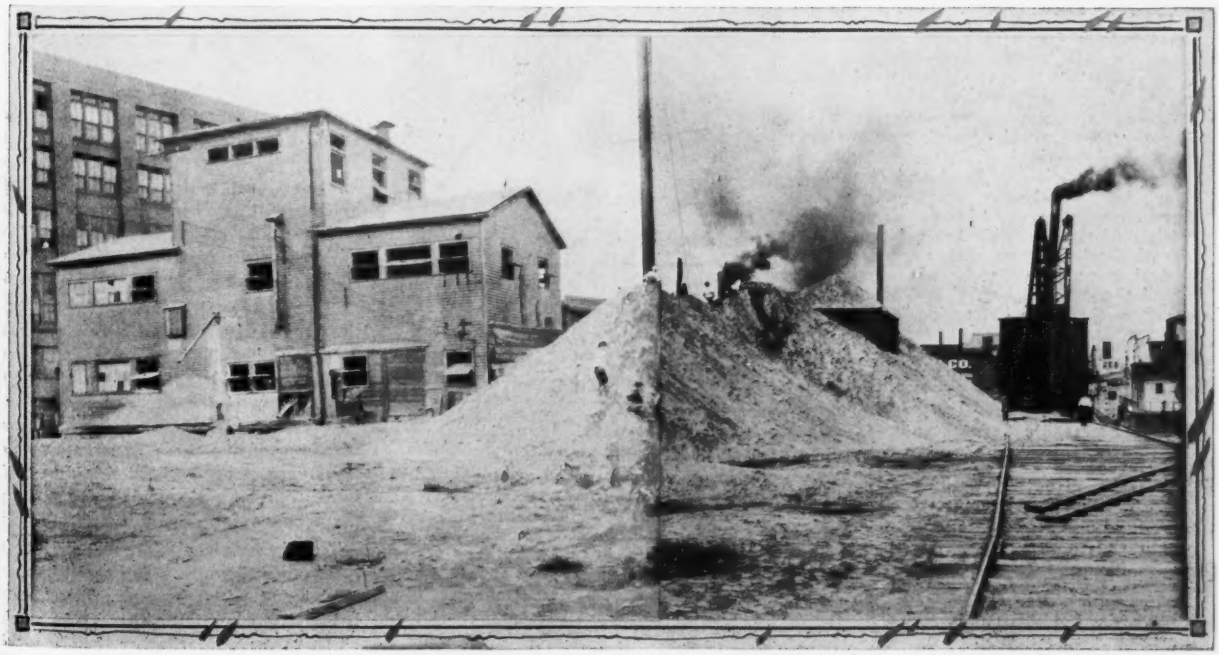
The average length of time required to pump a cargo is from three to four hours. Sand and gravel are not pumped at the same time, but the usual rule is to deposit the gravel in the fore part of the hold, and the sand in the aft part. As the material is pumped into the boat it is run over screens which separate the gravel and other substances from the sand and permit them to be washed overboard, through the sluiceways. The sluiceway is set up in sections about 12 ft. long. Each section is provided with two screens, which can be replaced to suit the size of material wanted. The screens are 12-in. wide and 16-in. long. An accompanying view shows the sluiceway containing screens ready for operation. The total capacity of all of the boats is in the neighborhood of 2500 tons per day. The different kinds of sands produced are concrete sand, fine mason's sand, asphalt sand, engine sand, and different grades of gravel.

The company has three docks on either side of the river at which to unload the sand. The dock in the southern part of the river contains a plaster plant, and the sand unloaded on this dock is used for making hard wall and wood pulp plaster. To unload the sand from the boat on this dock a 25-ton locomotive crane with 1½-cu. yd. grab bucket is used.

On the north dock, which is about







Various dock and shore plant views of Toledo Builders' Supply Co.

1200-ft. long, two 15-ton locomotive cranes with 1-cu. yd. grab buckets are used to unload the sand. On this dock is also the rest of the building materials that the company supplies. Then there is the West Toledo dock, where one 15-ton locomotive crane is used to unload the material. At this yard the company has installed a conveyor system for unloading sand and stone from cars to trucks at an approximate cost of $10,000.

The Toledo Builders Supply Co. has been very successful in the Maumee district and its methods are held in high esteem by other producers. The company sells its sand and other materials in Toledo mainly, but also has a considerable market in northwestern Ohio and southern Michigan. The officers of the company are as follows: A. R. Kuhlman, president; J. J. Crowe, vice-president; C. E. Kuhlman, secretary; J. C. Helwig, treasurer, and T. J. Degnan, boat superintendent.

Agitation for One National Mineral Aggregate Association

Coming Annual Meetings Present Unusual Opportunity at Least for a General Conference

ON OCTOBER 23, I. M. Clicquennoi, of the Wisconsin Mineral Aggregate Association, acting for the United Aggregate Committee, sent to the presidents of the National Crushed Stone Association, the National Sand and Gravel Producers Association and the National Slag Association, the following self-explanatory letter:

Mr. V. O. Johnston, Pres., Natl. Ass'n. Sand & Gravel Producers.

Mr. John Rice, Pres., National Crushed Stone Association.

Mr. L. A. Beeghley, Pres., National Slag Association

Gentlemen:

As you, no doubt, have been advised or are aware, committees representing the Minnesota, the Missouri Valley and the Wisconsin Mineral Aggregate Associations had a meeting some little while ago, in Chicago, since which time a large number of other producers have been written to.

On behalf of the members of the three Associations first mentioned, comprising approximately seventy-five producers, as well as on behalf of the other producers of the committee, we respectfully ask that arrangements be made for the calling of either a special meeting or having the annual meetings of the three National Associations (Stone—Sand and Gravel—Slag) held jointly for the purpose of at least considering the advisability and the wishes of the majority for a large, progressive, mineral aggregate association.

Acting on behalf and with permission of all those listed herewith, I would appreciate learning what action is taken in the matter.

Very truly yours,
(Signed) I. M. Clicquennoi,
Acting for Committee.

United Aggregate Committee

The committee of which Mr. Clicquennoi is chairman is composed of the following producers:

American Limestone Co...Knoxville, Tenn.
Beloit Sand & Gravel Co...Janesville, Wis.
Biesanz Stone Co.....Winona, Minn.
Birmingham Slag Co....Birmingham, Ala.
Bluffton-Lewisburg Stone Co., The.....
.....Lewisburg, Ohio
Bluffton-Lewisburg Stone Co., The.....
.....Lima, Ohio
Blue Limestone Co.....Minneapolis, Minn.
Buffalo Slag Co., The.....Buffalo, N. Y.
Carroll, J. E., Sand Co.....Buffalo, N. Y.
Conkey, H. D., & Co.....Mendota, Ill.
Davis Bros. Stone Co.....Lannon, Wis.
Dittlinger Lime Co..New Braunfels, Tex.
Drack, Louis.....Cincinnati, Ohio
Duluth Crushed Stone Co....Duluth, Minn.

I. M. Clicquennoi

Elkhart Sand & Gravel Co.....
.....Elkhart Lake, Wis.
Greenville Gravel Co., The.....
.....Greenville, Ohio
Holston Quarry Co.....Knoxville, Tenn.
Hughes Stone Co., The.....Catoosa, Okla.
Ideal Sand & Gravel Co....Mason City, Ia.
Janesville Sand & Gravel Co.....
.....Janesville, Wis.
Kaw River Sand Co.....Kansas City, Mo.
Lake Shore Stone Co....Milwaukee, Wis.
Linwood Stone & Cement Co.....
.....Davenport, Iowa
Lyman Richey Sand Co.....Omaha, Neb.
Minnesota Pipe & Tile Co.....
.....Mankato, Minn.
New Ulm Stone Co.....Mankato, Minn.
Platte River Sand & Gravel Co., The....
.....Denver, Colo.
Price Sand Co.....Tulsa, Okla.
Prince-Johnson Limestone Co.....
.....Kansas City, Mo.
Shiely, J. L., Co.....St. Paul, Minn.
Spencer, W. M.....Independence, Mo.
Stewart Sand Co.....Kansas City, Mo.
Tulsa Sand Co.....Tulsa, Okla.
Waukesha Lime & Stone Co.....
.....Waukesha, Wis.
Weston & Brooker Co., The.....
.....Columbia, S. C.
Wisconsin Granite Co.....Chicago, Ill.
Wisconsin Sand & Gravel Co.....
.....Milwaukee, Wis.

A glance at this shows that the list is representative of all the industries affected and includes some of the largest and most progressive producers.

So far it is understood that none of the three presidents has committed himself very far, but V. O. Johnston, president of the National Association of Sand and Gravel Producers, has taken a very liberal attitude and expressed a desire to determine where the majority of those in the industry stand on the proposed amalgamation of the three national organizations. It is understood that the time and place of the annual convention of the sand and gravel men has already been fixed, but Mr. Johnston believes these can be changed to conform to the desires of the two other associations.

A Good Opportunity

A splendid opportunity for a real get-to-gether exists in the annual convention of the American Road Builders Association and Good Roads Show in Chicago, the week of February 7, 1921, as noted elsewhere in these columns. All mineral aggregate producers are interested in this convention and in the exhibit of road-building equipment, machinery and materials. They could not only have one joint session together but they could also hold a joint session with the other road-building interests and discuss and act with them on matters of joint interest, such as the present open-top car situation.

Next year will undoubtedly usher in the greatest era of road building we have yet seen, provided transportation facilities are available. There are many matters that need the support of the entire road-building fraternity. The annual meetings of the three aggregate associations usually come about this time and it looks like a real opportunity to make them count for something worth while.

The big problem before all road builders is whether they are going to sit back any longer and take whatever railway service is left over after other interests have taken all they want, or whether they are going to "carry on" and get *a fair share*.

Missouri Cut-Stone Industry and Its By-Products

Quarrying and Finishing Carthage Limestone—Gathering and Utilizing the Waste Products

THE CARTHAGE, MO., DISTRICT is noted for its deposit of pure high calcium limestone (practically pure calcium carbonate), which because of the fineness of the grain and the regularity of the strata is widely used as a building stone for both exterior and interior purposes. The stone is known as a bastard marble, being very hard and crystalline, and is capable of receiving a high polish.

Quarry Operation

Several of the accompanying views will give an idea of how difficult a task the stripping is. In the first place the surface of the stone is anything but smooth, and because of this the only feasible method to remove the overburden is by pick, shovel and teaming. This is slow and expensive, but after having tried several other methods this one has been selected as the best.

After several feet of overburden has been removed in this fashion there is still from 3 to 10 ft. of flint stone to be removed before the pure limestone or bastard marble is uncovered. This stone is removed much the same as the pure limestone beneath is quarried. It is cut out in blocks to avoid shattering the ledge and thrown on waste piles.

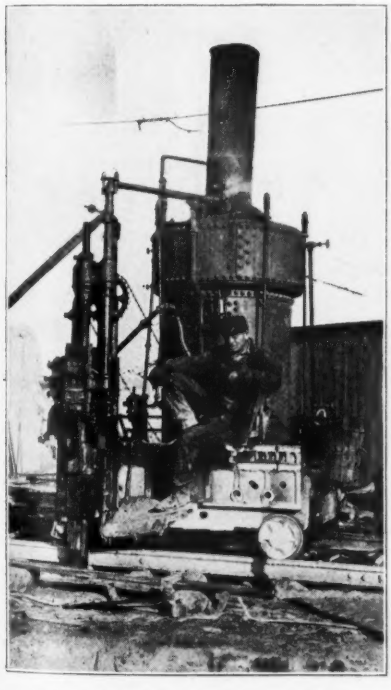
After the surface of the limestone has been cleared and the stone measured so that the proper width blocks may be cut, the channeling machine is set up. A locomotive type of channeler is used. The track upon which the channeler runs is placed so that a desired block of stone may be cut out.

The channeling bit is driven by a double-acting steam piston. After the cut has been made to from 3 to 7 ft. deep the block of limestone is wedged loose at the bottom and is picked up by a stiff-leg derrick and swung on to a quarry car. This rough stone is either taken to the exterior or to the interior finishing plant, depending upon the use for which it is intended.

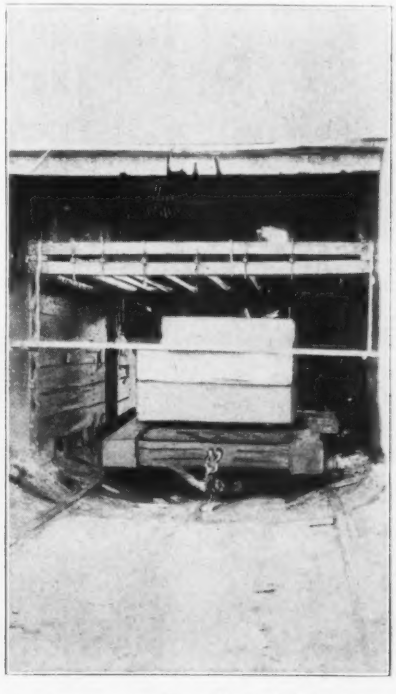
The first sawing is done with gang-saws. The rough block of stone is run into the sawing machine, where it is squared up, and the gang saws are set to cut the stone into certain widths. For interior work thin slabs are cut and often as many as 35 blades are put into the gang saw machine, and the block is cut into as many slabs. Where the stone is to be finished for exterior work it may be cut into six or eight pieces.

The gang saws are thin steel strips held taut between the ends of a rectangular frame, so that as it swings back and forth these steel blades will scrape on the stone. The downward feed is controlled by screws and is regulated according to the depth of the cut. The frame and saws are swung back and forth over the stone by a crank arm at one end.

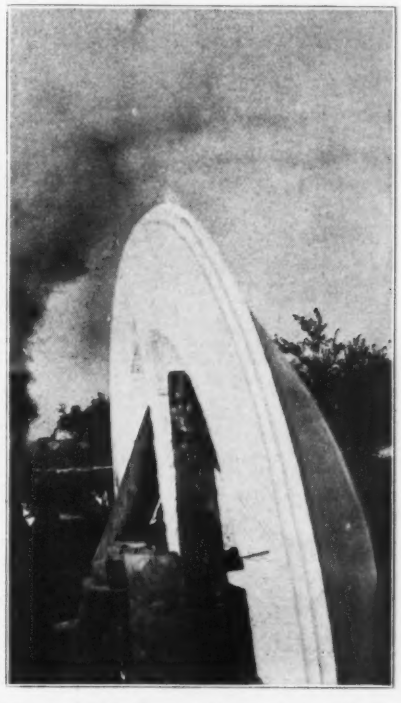
The cutting agent is in reality not the saws but is a fine quartz sand which is supplied with water. During all the sawing operation a stream of water is sprayed on the top of the stone. The water constantly washes particles of this highly abrasive material between the saw blade and the stone. As the saws swing across the stone they come in contact with the surface for a width of about 3/16-in., and cause the sand to cut the stone out of their paths. To make a deep



Steam-driven channeling machine



Gang saw and method of feeding



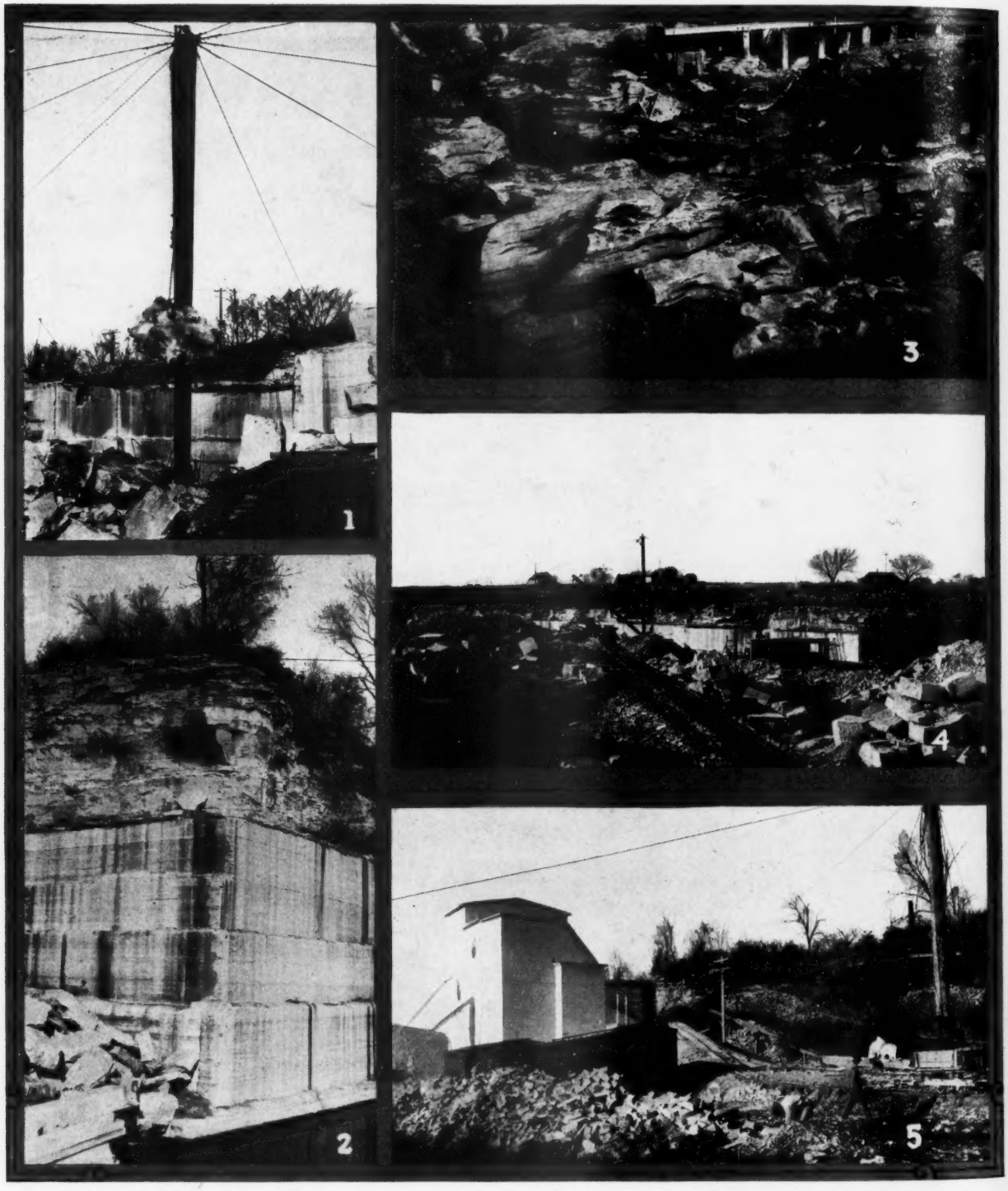
Example of some of the work turned out

cut where there are as many as 35 gang saws requires from seven to eight days of continuous cutting.

Until recently all of the stone has been sawed with the grain giving a plain white surface, but now the more popular product is made by sawing across the grain to bring out the grain. This cross-grain material is called "Colonial gray marble."

When the stone is to be cut for exterior work it is sent to a mill where planers, carborundum saws and lathes are used. The surface is dressed to a smooth white plane, but not polished. Considerable of this work is hand cut by means of pneumatic tools.

In the interior finishing plant the thin

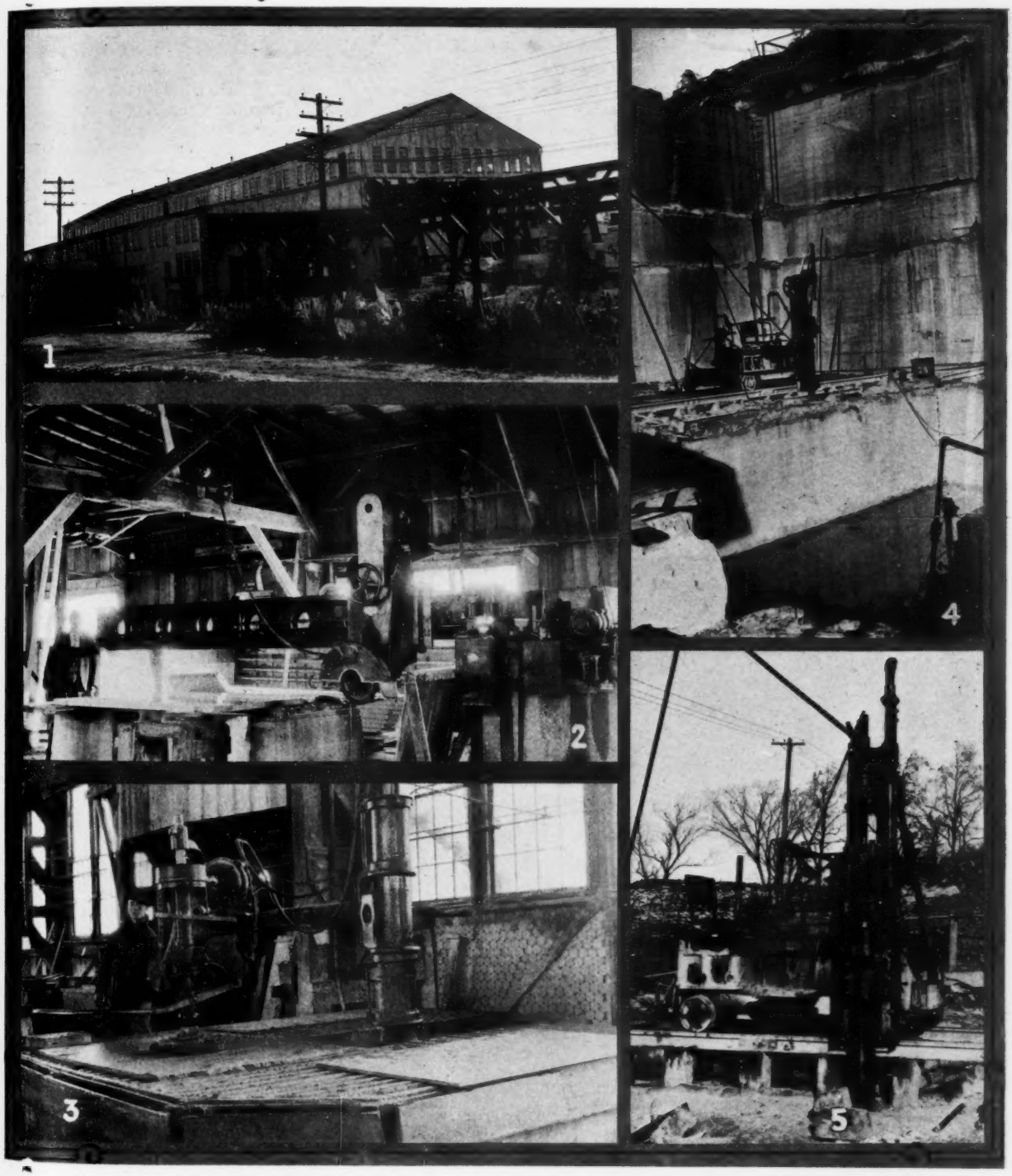


Views 1, 2, 3 and 4 show various features of the quarry operation; 1 and 2 show clearly the stripping necessary; 5 shows the crushing plant of the Carthage Crushed Limestone Co., which utilizes spalls

slabs are planed off, smoothed and then machined and hand polished with sand, pumice-stone and water. These slabs are carefully sized, trimmed and crated for shipment to all parts of the country.

In this process of quarrying and finishing, there is considerable waste stone—pieces too small to be of commercial use for building, yet because they are nearly pure calcium carbonate they are valuable for a number of other uses. These fragments are purchased from the cut-stone companies by the Carthage Crushed Limestone Co., to be ground and pulverized for chemical purposes.

The material is delivered to the company's property in open top railway equipment and unloaded by hand on large piles where the flint cores are rejected. Later the stone is loaded into side-dump cars which are pulled up an incline to a No. 3 gyratory crusher. This crusher reduces the material to 2½-in. and less—as orders require. The 2½-in. stone is



Stone working machinery at the mills in the Carthage, Mo., district; 2 shows a carborundum saw for sizing slabs for interior uses; 3 shows polishing machine for finishing interior slabs; 4 and 5 show the channeling machine at work in the quarry

sold as fluxing stone for steel, zinc and lead reduction.

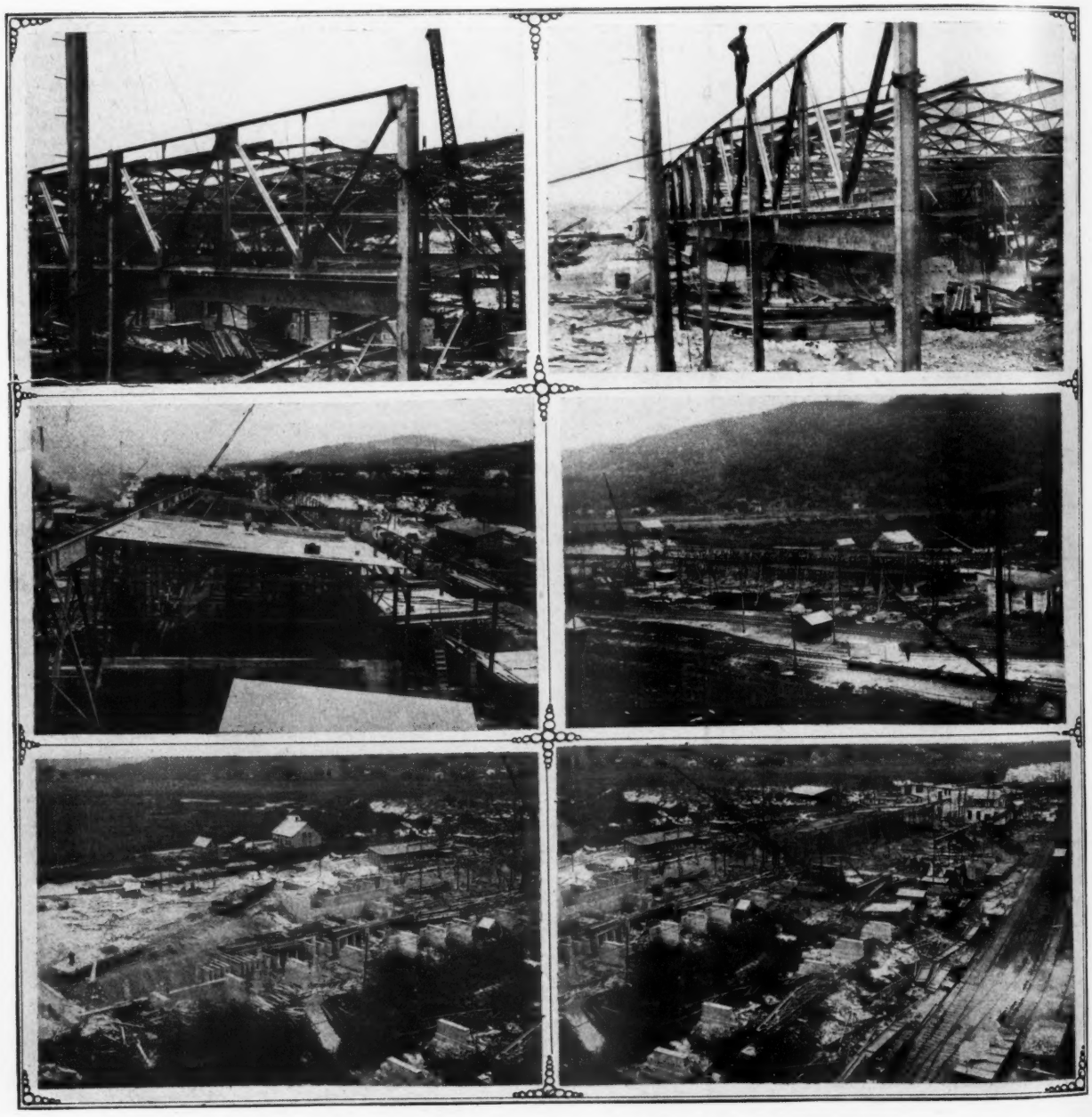
The product of the gyratory crusher which is to be further reduced goes to one of two hammer-mill pulverizers. A small cylindrical revolving sizing screen is used for the classification of the larger sizes and a small vibrating screen for the medium small separation.

For the production of extremely fine material, a second pulverizer and air separation are used. These give a fine white powder which is a substitute for English whiting in water-mixed paints. Other materials manufactured here are agricultural limestone and limestone sand for the glass industry. These products are elevated to a large bin, which feeds to a packing machine. Practically all material at this plant is sold in bags.

The entire plant is electrically operated —each machine being driven by a separate motor. A dust-collection system has been installed to reduce the amount of fine material in the air and recover it. L. E. Koken is general manager and president of the Carthage Crushed Limestone Co. The views of the cut-stone quarries and finishing plants were taken on the property of the Missouri Quarries Co., which belongs to the John Gill Sons Construction Co., of Cleveland, Mo., and the Carthage Quarry Co., of which F. W. Steadley is president and manager, and K. D. Steadley secretary and treasurer.

New Vermont Marble Co. Mill

THE VERMONT MARBLE CO. is building at West Rutland, Vt., what will be the largest and most up-to-date stone mill in this country if not in the world. The views below were taken about a month ago. The mill will be ready next spring.



New $500,000 stone-working mill of the Vermont Marble Co., West Rutland, Vt.

New Texas Trap Rock Plant

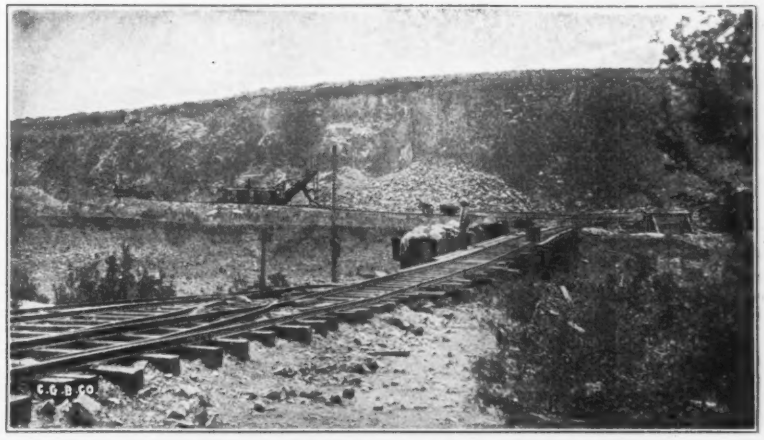
ONE OF THE NEWEST rock-crushing plants in Texas, where there is extraordinary activity in road-building at present, is that of the Texas Trap Rock Co., at Knippa, on the main line of the Southern Pacific Ry. about 90 miles west of San Antonio, and about 10 miles east of Uvalde.

The quarry has a face about 60 ft. in average height. The material is an extremely hard tough trap rock. Blasting is done by the "coyote hole" method. Two railroad type steam shovels, one with a ⅞-yd. dipper and the other with a 1½-yd. dipper, are used for loading. The stone is transported to the plant on a narrow gauge railway by steam locomotives. The cars are end-dumped from the top of an incline, the initial crusher being erected above ground level.

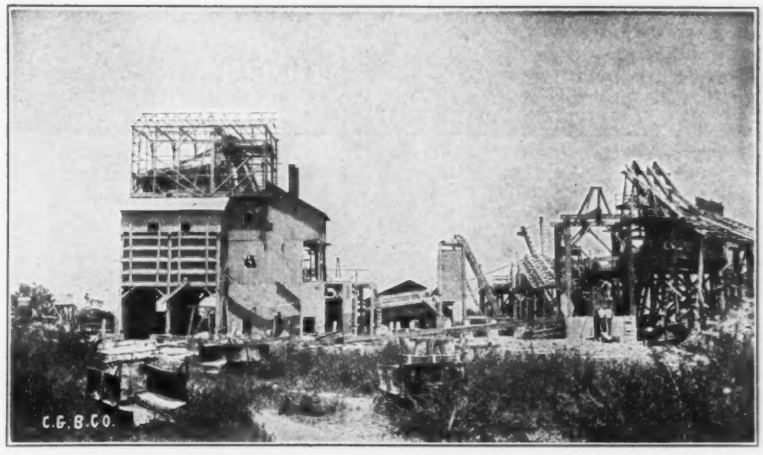
The crushing plant is equipped with one 40x42-in. all steel jaw crusher which feeds directly to a 30-in. belt conveyor. This conveyor discharges all its load into a No. 8 gyratory secondary crusher. The stream of crushed stone, all reduced to about 4-in. in size, is then taken by a bucket elevator and discharged into a rectangular bin, from which a large scalping screen is fed by gravity. This placing of a bin, as one of the views shows, between the main crushing units and the scalping and sizing plant assures a uniform flow of material to the screens and hence their most efficient service.

The rejections of the scalping screen go to a battery of four No. 5 gyratories, while the finished sizes are elevated to the top of the screening tower. All sizes of commercial stone from ¼-in. to 2½-in. material are made. Two car loading tracks are provided with gravity overhead bins.

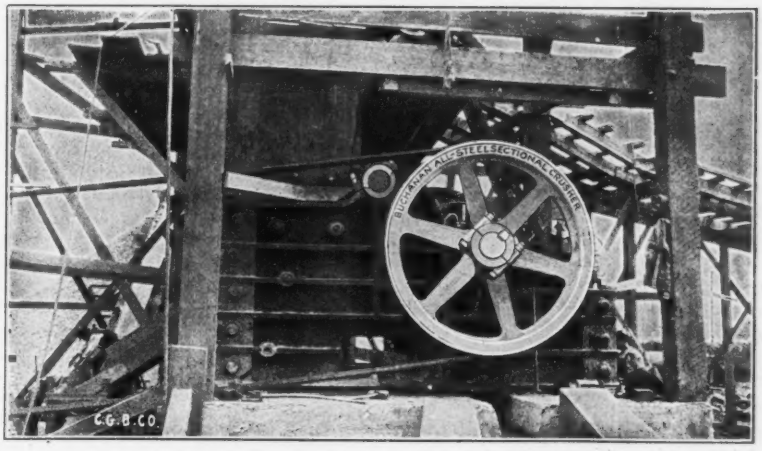
The general manager of the Texas Trap Rock Co. is A. H. Muir, San Antonio, Tex., and the resident superintendent is L. H. Kastner, Knippa. Preston K. Yates, consulting engineer, New York City, designed the plant.



Quarry of the Texas Trap Rock Co., Knippa, Texas



Crushing plant showing separated crushing and screening units



Buchanan 40 x 42-in. jaw crusher as initial breaker

Lime Man Will Be Next President's Secretary

GEO. B. CHRISTIAN, Jr., son of Col. Geo. B. Christian, president of the White Sulphur Lime and Stone Co., one of Ohio's pioneer lime manufacturers, will continue to be President-Elect Harding's secretary after March 4, 1921, according to a report in the Chicago Tribune. Mr. Christian was associated with his father in the limestone business in Marion and Columbus, Ohio, before going to Washington as secretary to Senator Harding.

Hints and Helps for Superintendents

Opening New Pit Quarry

IN A RECENT issue of ROCK PRODUCTS a complete and detailed description was given of the opening of a new pit quarry at the Luckey Lime and Supply Co., Luckey, Ohio.

The accompanying pictures were taken just as the blast occurred, and immediately after the smoke had cleared away, giving a pretty good idea to what height the upheaval reached and how much the quarry top was broken up. It was one of the most successful blasts ever made in opening a new pit quarry on a level rock surface, where there is no way to break out the rock except by lifting the entire mass upward.

Blast at Luckey, Ohio, on level quarry top

Results of blast, showing size of boulders thrown up

Two Thousand Tons of Rock with Four Sticks of Dynamite

FIVE HUNDRED TONS of limestone to a pound of 40 per cent dynamite! Can any quarryman beat this record? If he can, G. C. Buquo, superintendent of the G. C. Buquo Lime Co., Hot Springs, N. C., would like to hear about it.

This is how Mr. Buquo explains his remarkable blast: "You will note from the accompanying view the stratification of the stone and that the strata ran across the railway tracks. In order to get the desired output from this hill of stone, which was about 80 ft. high and some 100 ft. thick at the railway level, we had to work from both north and south sides. The north side working was begun about 50 ft. back from the track of the Southern Railway, and the south operation was started at the track and ran back about 100 ft. The north operation, starting first by several months, cut through before the south operation had traveled nearly so far, and there was left a pillar standing containing about 7000 tons. The strata, as you will note from the view, stand at about 15 degrees from the perpendicular. Now when the workings met and left the pillar we had a leaning mass of stone and a dangerous one, getting more dangerous as it got thinner. One day I found a fault in this mass which began within 2 ft. of the south side and ran out at the top of the mass on about an 80-degree angle and back from the railway till it appeared at the west side of the pillar. This fault had been healed by nature and had shown no disposition to open from the shooting that had been done, but we knew that if the right place were found it would open and all the stone on the south side of the fault would fall into the south working. The right guess was made and a hole 8 ft. deep drilled at the railway level right into the fault, and in it and four sticks of dynamite (2 lbs.) were inserted with cap and fuse and shot made. A mass of stone fell into the south working that gave us a full 2000 tons at the crusher. We kept track of the cars taken from the shot. From this you will see that this was not such a feat after all."

Results of a blast of only 2 lbs. of dynamite

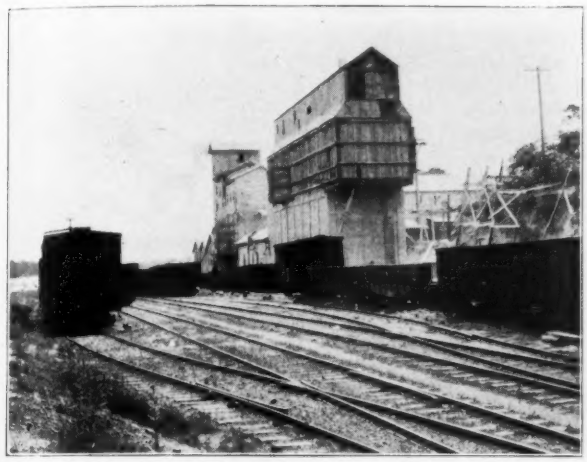
How to Close a Cotter Pin

HERE IS A KINK a pit man once taught an experienced shovel operator—For some time the operator had been struggling to pinch the ends together the spread ends of a ⅜-in. or ½-in. cotter pin so as to make it slip in. He was in an awkward position, his temper was slipping in gusts. "Let me show you," said the pit man. He took the cotter pin slipped his knife between the shanks about an inch from the end and tapped the end with a hammer, the trick was done.—"The Excavating Engineer."

Saving in Overhead Bins

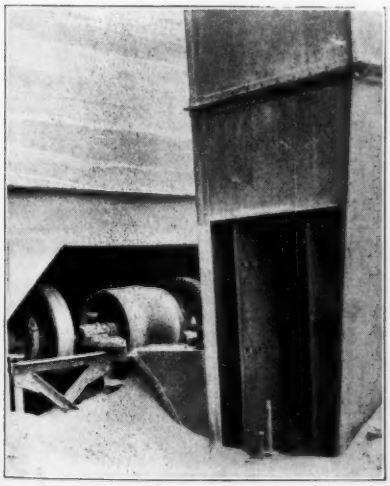
THE TWO VIEWS below illustrate a method of loading cars at the plant of Summit Silica Co., Barbertown, Ohio. The most notable feature of this method is the saving of considerable overhead room and the corresponding acquirement of greater bin capacity.

Underneath each bin is a belt conveyor, operated by an individual motor. The sand from the bins is allowed to drop by gravity on the belt conveyor, and in such a manner that an even flow is insured. The conveyor discharges into a hopper feeding a bucket elevator; that in turn deposits the material into another hopper to which is connected the downspout to the car.



Bin construction with storage to ground level

End view showing spout from top of elevator



Belt conveyor and elevator

This method of loading cars has proved very satisfactory to the company, and has increased their storage capacity considerably without additional expense. The material is of course the more readily handled in this manner because it is perfectly dry and flows easily.

Sand and Gravel Dredging Problem

IF YOU ARE A SAND AND GRAVEL DREDGE OPERATOR and can solve this problem let's hear from you, please!

A middle west operator writes: "We are operating a 12-in. sand pump on river material.

"The material is sand and gravel mixed, most of it grading under 1-in. in size, but there are larger boulders and chunks of limestone, the limestone being usually about 3-in. thick and all sizes to even too large to enter our 12-in. suction pipe. When one of these pieces lands on the end of the pipe it sticks there because of the suction and we have to raise the suction ladder till the end of the pipe is near enough the surface to get the rock off. We do this without losing our suction but it takes a lot of time.

"In the suction line, about two-thirds of the way down the ladder, we have a regular rock trap which fills up every twenty to thirty minutes, according to whether we are deep in the sand or shallow, the material gets coarser as we go deeper. We reach a maximum depth of 36 ft. with our suction but the material is much deeper than that. We have to pick up the suction ladder, open the trap door on top of the trap and empty it by hand. It is not practical to use a dumping trap as the rock roll down into the pit, as we go deeper."

How do you meet this condition? Let's have some suggestions from practical men.

Another Concrete Cement Mill

ATTENTION has already been called to the reinforced-concrete construction features of the Superior Portland Cement Co. plant at Concrete, Wash. The view herewith shows a similar belt conveyor gallery, also constructed throughout of reinforced concrete. This is at the plant of the Dewey Portland Cement Co., Dewey, Okla., of which P. R. Chamberlain is superintendent.

Concrete belt conveyor gallery at Dewey cement plant

Limestone and Its Products in the Chemical Industries*

Summary of the Wide Field of Usefulness for a Most Common Variety of Rock

LIMESTONE, one of our commonest rocks, is of sedimentary origin, having been deposited from solution by living organisms, or by chemical and physical processes not related to changes in living matter.

Limestone is never found pure. Its impurities, chiefly magnesia, iron, alumina and silica, and its physical properties, determine not only its classification, but that of its products, viz., quicklime and hydrated lime, the former being limestone with its carbon dioxide removed by heat, the latter being quicklime to which has been added sufficient water to insure complete hydration (slaking) under such conditions that the heat generated will evaporate the excess water, leaving the product dry and, after screening to various commercial degrees of coarseness, available for use for any purpose for which quicklime is suitable. The advantages associated with its use more than counterbalance the freight on the contained water arising from hydration.

Classification—Limestone

Calcite is very pure crystallized limestone. As the magnesia (MgO) content increases, the stone is called magnesian limestone until the ratio of calcium carbonate ($CaCO_3$) to magnesium carbonate ($MgCO_3$) become 100 to 84 when it is termed "dolomite." With magnesia content low and other impurities increasing, the rock is known as argillaceous (clayey) limestone, natural cement rock, suitable for Portland cement manufacture, and calcareous shale. Marble is limestone metamorphosed by heat.

Classification—Lime

High calcium: Not less than 90 per cent. calcium oxide, CaO.

Calcium: Not less than 85 per cent. nor more than 90 per cent. CaO.

Magnesium: Not less than 10 per cent. nor more than 25 per cent. magnesium oxide, MgO.

High Magnesium: Not less than 25 per cent. MgO.

The total amount of impurities, exclusive of CO_2 should not exceed 5 per cent. in selected lime, or 7½ per cent. in run-of-kiln lime. According to availability for use, lime may be classified as building, finishing, chemical or agricultural lime.

Use of Limestone, Lime and Hydrated Lime in the Chemical Industries

In many branches of chemical manufacture limestone, lime and hydrated lime are used interchangeably, the value residing in the CaO content. Hydrated lime should contain less impurities than the lime from which it is made; also it keeps better and is easier to handle than lump lime. When lime is used in a hydrated condition, unless the heat of slaking is utilized, hydrated lime is more economical.

Natural Cements

These cements, whether made from rock or from blast furnace slag, are much more acid in character than Portland cement. The addition of lime by increasing the basicity, increases the strength, E. G., addition of 5 per cent. lime to some natural cements increases the tensile strength from 100-200 per cent. A hydrated high calcium lime must be used. Magnesia is objectionable because it is apt to carbonate after the cement has set, which weakens it. Other impurities are of little importance. Addition during grinding of the cement insures intimate admixture.

Sand-Lime Brick

Sand-lime brick, although a rather new material, is of some importance in the building industry. The process of manufacture consists in forming bricks of a mixture of sand and hydrated lime by means of pressure. The bricks are then treated with high-pressure steam, which causes chemical combination between the sand and lime. The lime may be hydrated before or after adding the sand, but hydration must be complete before the bricks are pressed in order to prevent any further change of volume.

High-calcium lime must be used. Any large amount of magnesia is dangerous, because it will probably not be hydrated until after the brick is pressed into shape. The steam treatment will hydrate the magnesia, which will expand and either weaken or completely disintegrate the brick. The impurities generally present are not harmful, except in so far as they may cause the lime to slake more slowly. In fact, kaolin, up to 2½ per cent., may be considered beneficial. Hydrated lime is to be preferred to quicklime because it is more easily mixed with the sand. This statement is made on the assumption that the hydrated lime is perfectly and completely hydrated. Most sand-lime brick manufacturers prefer to buy quicklime and hydrate it themselves, because they must be absolutely certain that the hydration is complete.

Glass

Calcium oxide is a necessary constituent of plate, sheet and bottle glass, and of a large portion of pressed and blown glass. It acts as a flux. Magnesia makes the glass more difficult to melt, but is sometimes a valuable constituent when particular optical properties are to be obtained.

The calcium oxide is generally introduced as ground limestone, but in this industry also, the use of lime or hydrated lime is sometimes necessary in order to avoid the evolution of gas at high temperatures. The ordinary impurities of limestone are, in general, of no importance to the glass manufacturer. For white glass, however, the content of oxide of iron must be less than three-tenths of 1 per cent. of the stone.

Lime used in glass factories in 1918 amounted to 34,051 tons, valued at $265,855. This represented 1.1 per cent. of the total lime produced.

Ceramics

Lime and magnesia, generally, however, as carbonates, are used to some extent as fluxes in the manufacture of pottery and porcelain. It has been found that for wares burned at moderate temperatures, calcium oxide tends to bring the points of vitrification and fusion close together, while magnesia tends to separate them, to lower the temperature of vitrification, and to decrease the change of shape due to burning.

On the other hand, if the ware is to be burned at higher temperatures, magnesia has little effect on the points of vitrification and fusion and increases shrinkage. In a series of experiments to determine the values of different bases when used as fluxes for a mixture of feldspar, flint and clay, it was found that magnesia gave the best results of the five bases tried (oxides of calcium, magnesium, barium, strontium and zinc). It gave an excellent color, high tensile strength, and only moderate shrinkage.

The above results all indicate that magnesia is better than calcium oxide as a flux for ceramic bodies.

*From the October 1920 issue of "Chemical Age."

The carbonates are generally used, since they are the cheapest forms. Levigated natural whiting is preferred on account of high colloidal content. In some cases, however, vitrification sets in before the carbonates are all decomposed, and further evolution of gas may cause pinholing or internal strain. Under these circumstances it is necessary to use either the oxide or hydrate. It is sometimes desirable to use the carbonates in wares burned at low temperatures in order to obtain a porous body.

Since the quality of carbonate used is generally small, and the chemical composition of the mixture may vary slightly, it follows that the impurities generally found in limestones are entirely negligible.

In glazes, magnesium oxide tends to absorb SO_3 from the kiln gases with production of a scum appearance. Although this can be overcome by skillful firing, it makes a low magnesia content desirable in most glazes.

Water Purification

Temporary hardness of water is caused by the presence of calcium carbonate. This substance is practically insoluble in pure water, but is held in solution by the presence of carbon dioxide, which is found in practically all natural water. If this carbon dioxide is removed, the calcium carbonate will be thrown out of solution. The carbonic acid may be removed by boiling, but it is cheaper to neutralize it with lime. The lime reacts with the carbon dioxide to form calcium carbonate, and, since the carbon dioxide is thus removed, this calcium carbonate, together with that originally present, will be thrown down as an insoluble precipitate. While any magnesium carbonate present in the water will be removed by the same process, the magnesium oxide in the lime will take no part in the reaction and must be considered as an impurity.

The lime to be used should contain as much calcium oxide as possible. The generation of heat on slaking is of advantage in this process, for the reaction takes place more efficiently at elevated temperatures. Therefore the quantity of impurities should be low, and the use of hydrated lime is not advisable.

Soda Ash and Caustic Soda

Most of the soda ash sold in this country is made by the ammonia-soda (Solvay) process, which is based upon the precipitation of sodium bi-carbonate from an ammoniacal solution of common salt by means of carbon dioxide. Ammonia appears in the form of the chloride from which it is recovered by treatment with lime and distillation.

This industry demands limestone, for both the lime and the carbon dioxide are used. The impurities in the stone are not harmful. It would seem that magnesium oxide should be as effective as calcium oxide in breaking up the compounds of ammonia, yet Lunge[1] makes the statement that "magnesium limestone is not suitable for this industry."

Solutions of caustic soda, which are used in the purification of cotton, rags and wood pulp in the manufacture of paper and explosives, are made by causticizing soda ash with lime. The reaction produces insoluble calcium carbonate, which settles to the bottom of the tank, and caustic soda remains in solution. The lime for this purpose should be as pure and as high in calcium as possible. Magnesia and other impurities are objectionable because they are slow in settling out after the reaction is completed. This results either in contamination of the soda or in a decrease in the daily output of the plant. In this industry quicklime is preferable to hydrated lime because it hastens the reaction.

Bleaching Powder

Bleaching powder is an oxychloride of calcium which is formed by the action of chlorine gas on moist slaked lime. The resultant product is sold on the basis of available chlorine. Any impurities in the lime will lower the amount of chlorine absorbed and consequently the value of the product. Magnesia is especially objectionable because it forms magnesium chloride.[2] This substance absorbs water from the air and makes the powder sticky and hard to handle.

Hydrated lime is better suited for this industry than quicklime, because it contains fewer impurities, is easier to handle and requires no preparation before using.

Calcium Carbide

This substance, used as a source of acetylene, is made by heating a mixture of lime and coke in an electric furnace. For this purpose the only useful ingredient of the lime is calcium oxide. Magnesia and other impurities are objectionable because the whole charge must be fused, and electric power is too expensive to waste it by heating useless material. For the same reason quicklime is preferable to either hydrated lime or limestone.

Illuminating Gas and Ammonia

When illuminating gas is made by the distillation of coal the crude product contains, among other compounds, carbon dioxide, hydrogen sulphide and hydrocyanic acid. All of these would be objectionable to the consumer. Their removal may be effected by passing the gas through layers of moist slaked lime. For this purpose calcium oxide only is useful, although the magnesia and impurities are not harmful. Hydrated lime is to be preferred to quicklime because it is easier to handle and requires no preparation.

[1]Lunge, Sulphuric Acid and Alkali, 3, p. 37.
[2]Lunge, Sulphuric Acid and Alkali, 3, p. 440.

Calcium Cyanamid and Calcium Nitrate

These substances, known technically as lime nitrogen and nitrate lime, have recently been put on the market as commercial fertilizers. They represent means of converting the nitrogen of the air into plant food.

Calcium cyanamid is prepared by heating a mixture of lime and coke in an electric arc furnace and treating the fused mass of calcium carbide with nitrogen. The nitrogen is obtained by the fractional distillation of liquid air. Pure, high-calcium quicklime is required for this industry. Any impurities are undesirable on account of the expense required to heat them.

If air is passed through an electric arc, the nitrogen and oxygen contained in it will combine. The oxides of nitrogen thus formed, when dissolved in water, produce nitric acid, which may be combined with any base to form the corresponding nitrate. Since lime is the cheapest of all bases, and has fertilizing value of its own, it is obviously the best base to use. Hence calcium nitrate is produced commercially by this method. Magnesia acts in a similar manner. The presence of impurities in the lime is a matter of indifference, and quicklime, hydrated lime or limestone will produce identical results. Hydrated lime is probably the most economical.

Fertilizer

Lime is used extensively as a fertilizer. The Department of Agriculture and the various state agricultural experiment stations have investigated the use of lime for this purpose and have published their conclusions in numerous bulletins.

A correlation of these results will lead to the following general statements:

(1) A plot of ground is in need of lime when it fails to produce a good crop of common red clover, or when the clover crop contains patches of sorrel.

(2) Lime should never be used alone, but always in connection with some organic fertilizer.

(3) Care must be taken not to use too much lime, as this will tend to waste the plant food stored in the soil. If the lime is coarsely ground more must be used, but its effect will be more lasting.

(4) Magnesia is at least equally as valuable as lime for use as a fertilizer.

(5) Whether the lime should be applied as ground quicklime, hydrated lime, air-slaked lime or ground limestone depends chiefly on the cost per unit of calcium oxide (it being assumed that the four substances are of the same fineness). Thus 500 pounds of ground quicklime, which is the quantity recommended for one acre, are equivalent to 950 pounds of hydrated lime or 1,250 pounds of either ground limestone or air-slaked lime.

(6) Lime is sometimes used to improve

the drainage conditions in the soil, and for this purpose ground quicklime alone is suitable.

Spraying

Lime enters into the preparation of a number of insecticides used in spraying vegetation. For such purpose calcium oxide is the only useful constituent of the lime. Magnesia and impurities are not harmful. The physical quality of the lime is of paramount importance. The material is sprayed on the vegetation through some form of atomizer, and therefore must contain no coarse particles or grit. For this reason hydrated lime screened to pass 150 or 200 mesh (a commercial article) would certainly give better satisfaction than lump lime.

Sugar

In the manufacture of sugar both carbon dioxide and lime are used. Therefore, sugar manufacturers prefer to buy limestone and burn their own lime.

The juice extracted from either beet or sugar cane contains various impurities. Some of these would discolor the sugar and other (organic acids) would invert it; that is, they would change the sugar into crystallizable glucose, and thus reduce the yield. In order to remove these impurities the juice is heated almost to boiling in the presence of an excess of lime. This combines with the acids and breaks up the other organic compounds forming insoluble salts, but it also forms an insoluble compound with the sugar itself. For this reason, after the lime has completed its action, carbon dioxide is forced into the liquid. This breaks up the combination between the lime and sugar and throws down all the lime as calcium carbonate. This precipitate carries with it all suspended matter, leaving a clear solution of sugar.

For the above purposes calcium oxide only is useful. Impurities are apt to cause trouble. Thus, magnesium carbonate is more soluble in sugar solutions than calcium carbonate, and the salt so dissolved is later deposited on the tubes in the evaporating pans, thus making it necessary to clean them more frequently. Any silica present is thrown down as a gelatinous precipitate. This becomes a general nuisance by coating the cloth in the filter presses.

Limestone and Lime Used by Sugar Factories in Refining, 1916-1918

	1916		1917		1918	
	Quantity (short tons)	Value	Quantity (short tons)	Value	Quantity (short tons)	Value
Limestone	369,028	$369,694	530,612	$666,138	435,555	$649,589
Lime	21,923	118,572	47,546	381,746	36,494	314,748
Total		$488,266		$1,047,884		$964,337

Distillation of Wood

The destructive distillation of wood gives rise to four products: gas, pyroligneous acid, tar and charcoal. Of these, pyroligneous acid is of most interest to the lime manufacturer. From this solution are prepared wood alcohol, acetic acid and acetone, and lime is an essential ingredient in the manufacture of all of these. First, the crude acid is tested with an excess of lime and distilled. Wood alcohol passes over. The material remaining in the still is known as gray acetate of lime. From this, acetone may be produced by dry distillation, or it may be treated with sulphuric acid and the acetic acid distilled off. The wood alcohol is again treated with lime and redistilled in order to purify it.

For any of the above purposes calcium oxide is the only useful constituent of the lime. Magnesia and impurities are not harmful. Hydrated lime may be used instead of quicklime for any of the above purposes except the final distillation of the wood alcohol. For the other purposes probably neither substance has any advantage over the other.

Paper

Wood pulp for the manufacture of paper is prepared by one of four processes: Mechanical, soda, sulphite or sulphate, of which only the last three interest the lime manufacturer.

In the soda process lime is used to causticize sodium carbonate, thus recovering the caustic soda used in cooking the wood. The quality of lime required for this purpose was discussed under "Soda Ash."

Lime Used in Paper Manufacture, 1917 and 1918

Process	1917 Short tons	1917 Value	1918 Short tons	1918 Value
Soda	171,865	$ 994,417	149,443	$1,229,579
Sulphite	77,020	422,026	88,631	726,610
Sulphate	28,154	172,635	34,515	260,726
Strawboard	9,918	55,149	19,058	146,335
Rag	(a)	(a)	14,649	115,283
Unspecified	68,811	364,206	18,876	132,112
Total	355,768	$2,008,433	325,172	$2,610,645

Another solution which may be used in place of caustic soda for dissolving the cementing constituents of wood is bisulphite liquor. This is a mixture of calcium and magnesium bisulphites held in solution by an excess of sulphur dioxide. The liquor is prepared by one of two methods: Limestone may be subjected to the solvent action of sulphur dioxide and water; or milk of lime may be treated with sulphur dioxide. The resultant solution is the same in either case.

For the maker of sulphite pulp magnesia is a desirable constituent of the lime or limestone. Magnesium sulphite is more soluble than calcium sulphite, and consequently permits of making a stronger liquor. Moreover, the presence of magnesia in the liquor gives the pulp a better color and makes it softer to the touch, so that it will felt together better when made into paper. Therefore, dolomite or magnesian lime, is much preferable to the high-calcium compound. The impurities are not harmful. If limestone is used it should be as porous as possible to permit of rapid solution. Hydrated lime is preferable to lump lime, because it is easier to handle and contains fewer impurities.

Paints

Ground lime, air-slaked lime, levigated chalk (natural whiting) and chemically precipitated calcium carbonate are used to a large extent in the paint and allied industries. For these purposes fineness of grain is essential, while sometimes the color or chemical composition is of equal importance. It is generally impossible to obtain a limestone of sufficient whiteness, or to grind it sufficiently fine to meet the requirements. It is therefore an advantage to use air-slaked lime or hydrated lime.

Tanning

In the leather industry lime is used in the depilation process. The hair is so loosened from the hide by soaking it in lime water that it can be removed by subsequent scraping. In regard to the quality of lime to be used it is said that the presence of magnesia and clay is injurious, not only by diminishing the amount of lime present, but by making the lime much more difficult to slake; and iron oxide, though quite insoluble, may become mechanically fixed in the grain of the hide, and may be the cause of subsequent stains. The use of hydrated lime would remove the above objections to magnesia, but not those to iron. Hydrated lime is probably preferable to quicklime for this reason and because it is easier to handle.

Lime used by tanneries in 1918 amounted to 74,350 tons, the largest amount ever reported, valued at $637,960—an increase in quantity of 12 per cent and in value of 56 per cent over 1917.

Tonnage of Lime Used in Chemicals

The latest available statistics (1918) show that for that year 26 per cent. of the chemical lime was used in alkali manufacture. Calcium carbide manufacture consumed 15 per cent.; acid manufacture 7 per cent.; bleaching 7 per cent.

[A table accompanying this article is printed on page 43 of this issue.]

Burning Limestone for Both Lime and Carbonic Acid Gas

I—How They Do It in the Beet Sugar Industry—Pot Kilns and Coke Fuel

THROUGH THE COURTESY of one of the largest beet sugar manufacturers in the United States, ROCK PRODUCTS has been given permission to draw from a series of lectures, prepared by the chemists of the sugar company for the instruction of its employees, a series of articles on the lime-burning part of the sugar industry.

These articles should prove of more than ordinary interest to commercial lime manufacturers because the chemistry of lime burning is very completely gone into, and because lime manufacturers have long known that in burning lime by the ordinary process a product fully as valuable as the lime is wasted. That is the CO_2—carbon dioxide—which escapes into the atmosphere as a gas.

This carbon dioxide, or carbonic acid, has many uses in industry, and its uses are constantly increasing. Great quantities of it are required for making modern non-alcoholic beverages. It has a use as a fertilizer and in many other fields. It is also possible to develop many new fields.

Experiments have been made to utilize carbon dioxide in curing sand-lime brick. These early experiments cannot be regarded as successful, but the results were by no means conclusive. Lime mortar is permanently set by conversion of the lime to the carbonate, or limestone form through the absorption of the carbon dioxide from the atmosphere. It may be possible to hasten this process.

The sugar industry has possibly had more experience in the large scale production of both lime and carbon dioxide together than any other industry or individual. Both products are used in the manufacture and refining of beet sugar and their production has been reduced to an exact science and uniform practice.

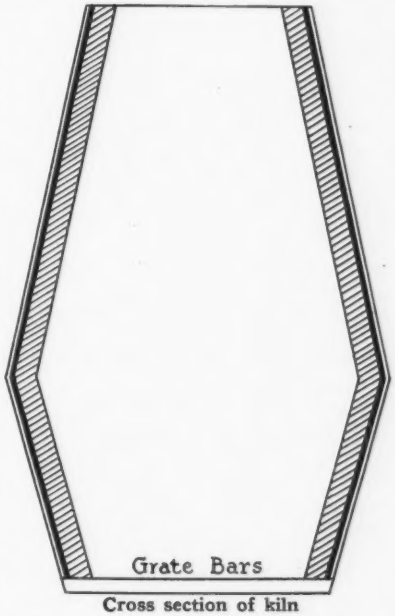
Lime Kiln

There are many types of lime kiln, but as the Belgian kiln is the one which is most commonly used in the sugar industry, a description of this will suffice.

The kiln consists of two truncated cones, with the large ends or bases joined together; the lower cone is generally much shorter than the upper one and also has more slope.

The casing is made of heavy sheet metal, riveted in such a manner as to be reasonably air tight, and provided with a number of rows of holes, each having a swinging door, the purpose of which is to permit of inspection of the interior of the kiln during operation, and also, if the occasion demands, to allow the use of poker bars for releasing a bridged condition. The casing is lined with fire brick about 14 in. thick, and between the fire brick and the casing there is left a space of about 2 or 3 in., which is filled with sand or cinders. The purpose of this is to decrease the radiation and to protect the casing against excessive temperatures.

The kiln is supported on legs in such a manner that the bottom is from 4 to 6 ft. above the floor. The bottom of the kiln is provided with grate bars so arranged that they may be moved sideways to permit the lime to fall on the floor when it is desired to discharge the kiln.



Cross section of kiln

The top of the kiln consists of a bonnet, in which there is a swinging door, which is reasonably air tight, and is kept closed except for the short periods when it opens to admit the charges. A chute from the top of the elevator conducts the charge to this door. The charge pipe projects downwards into the center of the kiln for a distance of about 6 ft., the purpose of this being to concentrate the charge so that it will not scatter over the cross section of the kiln.

Two gas pipes are usually connected to opposite sides of the kiln at a point between the bottom of the charge pipe and the top of the kiln, and these two pipes are then brought together into a single pipe of sufficient capacity.

A gas washer is a cylindrical vessel provided with an inlet and an outlet for the gas, and also with water spray lines. The gas is cleansed by passing through these water sprays. Suitable water separators are installed in the gas line leaving the washer. As the gas washer is under a slight vacuum, due to the action of the gas pump, the water is discharged by running out under a barometric seal, similar to the method used with a vacuum condenser.

Gas Pump

As a general rule, the gas pump is of the reciprocating, steam driven, duplex type. This permits of variation in the speed to suit changed conditions, which is not possible with a pump driven by a belt or a motor. The gas pump is the controlling factor in handling the lime kiln, as a certain amount of gas must be removed for each ton of lime burned, and only as much lime will be produced as corresponds to a certain amount of gas.

If the top of the kiln were left open, there would be a natural draft sufficient to burn some lime, although not as much lime as would be burned with the aid of a gas pump. As the gas must be recovered for manufacturing purposes, and must be of a high degree of purity, every effort is made to prevent the leakage of air into any part of the system between the kiln and the gas pump, the whole being under a slight vacuum.

The gas pump draws air into the bottom of the kiln. This air supplies the oxygen for the combustion of the fuel, and the heat of combustion drives off an additional amount of gas from the limestone, so that the gas handled by the pump consists of the oxygen in the air which is drawn into the bottom of the kiln, the carbon dioxide gas produced by the combustion of the coke, and the carbon dioxide gas produced by the decomposition of the limestone, together with such excess air as may have been drawn into the system. The gas pump draws all of this gas from the top of the kiln, compresses it, and forces it under pressure into the distributing system of the carbonation apparatus.

Operation

In the operation of a lime kiln, the first requisite is a supply of both limestone and coke of high quality. The limestone must be as free as possible from impurities, of which silica is the most objectionable, and

should contain at least 97 per cent calcium carbonate. The coke should preferably contain at least 90 per cent fixed carbon and should be free from any excessive amounts of sulphur or volatile matter.

It is best to have the limestone broken in as nearly as possible uniform pieces, of 4 to 8 in. diameter. The coke should also be broken into uniform pieces of such a diameter that it will all be consumed; this is best determined by actual experiment.

The limestone and coke should be mixed intimately, and charged into the kiln in such a manner that they will stay mixed. This, however, is more easily said than done, as there is a tendency for the coke and limestone to separate, and also for the larger and smaller pieces of the coke and limestone to segregate, simply as a result of passing through the chute and charging pipe and falling into the kiln. The tendency is for the heavier material, such as the limestone, and in particular the larger pieces of the limestone, to roll farthest; thus there results an accumulation of the finer pieces of limestone and coke in the center of the kiln, and of the larger pieces at the circumference.

It is possible to overcome the effects of this to a great extent by drawing the lime alternately from each side of the kiln, and by changing the point at which the draw is started. The conical shape of the kiln is also of benefit, because, when the level is lowered to a point of greater cross section, the tendency is for the larger pieces to be brought back towards the center of the kiln.

In order to get the best results from the lime kiln, a definite policy of uniform operation must be followed, whatever that policy may be. No more lime should be drawn than corresponds to the amount of limestone charged. This is roughly 50 per cent by weight. The kiln should always be kept full. When drawing is started, charging should be started, and both should be carried on at the same time. This avoids allowing the charge of limestone and coke to fall any greater distance than is necessary, and reduces the segregation caused in this manner.

The charging and drawing should be done at regular intervals, starting always at the same hour and taking the same length of time, which should be the shortest possible to accomplish the operation. These intervals should be as short as is consistent with circumstances, not less than two hours, and not more than three hours apart. After all concerned have become accustomed to this regular routine, it will be possible to detect any irregularity in the condition of the kiln by comparing the prevailing condition with a well-known uniform condition, which comparison would be impossible if the method of operation were so irregular that no one knew exactly what had been done, or how any particular condition had been produced.

It is a very good plan to have a blackboard hung in a place convenient to the scales, so that an accurate record may be kept of the total weight of limestone charged to the kiln. This record should show the number of skips for each charge, and also the number of wheelbarrows of lime from each draw, and the total. By following a regular system of this kind, it will soon be found that all concerned will become familiar with the characteristic condition of the kiln corresponding to certain operations. The movement of the fire zone up and down with the draw will be apparent, and will be proportional to the amount of limestone charged each time.

The use of a suitable recording thermometer, the bulb of which is installed in such a way as to show the temperature of the gas just as it leaves the kiln, will be found to furnish a record which is invaluable.

Ordinarily the hottest part of the fire where the lime is burned should be about midway of the kiln, and this will not move more than from 2 to 4 ft. either way with regular operation. This will leave about one-third of the material in the kiln above the fire, where it serves to absorb a portion of the heat, and the bottom third of the kiln will be occupied by burned lime, ranging in temperature from red hot to completely cold.

If short and frequent draws are made, it is a simple matter to be able always to draw cold lime from the kiln, and to follow the rule not to draw any more than has actually cooled down. If hot lime is drawn, it is a sure sign of wrong conditions in the kiln, and this in turn tends to make things worse.

The air which is drawn in for combustion must pass through the body of burned lime, from which it removes the heat, thus cooling the lime, and at the same time effecting an economy of fuel by heating the air for combustion. It is impossible to increase the production of lime by any other course of action than that of pumping more gas, that is by supplying more air to burn additional fuel. All that is necessary is to speed up the gas pump, and to draw more lime at the time each draw is made, in proportion as the speed of the pump has been increased.

The presence of fine pieces of limestone and coke is detrimental because it reduces the air passages and increases the resistance against which the pump has to work, thus reducing capacity. The ideal condition would be to have all pieces of limestone the same size and all pieces of coke also the same size, and, while this is probably impossible in practice, this knowledge serves as a guide in approaching this condition as closely as possible. Fine coke is especially to be avoided, as this tends to accumulate in the center of the kiln and stops up the air spaces. As a result the air passes through at some other point, and the fine coke is not completely burned. It is much better to throw it away, and it is false economy to attempt to use it when it does more harm than would correspond to the saving.

It is sometimes the practice to inspect the peek holes and thereby pronounce judgment on the condition of the kiln, saying the fire is too high or too low, etc. This is a bad practice, as it is impossible for any one to say just how high the fire should be unless he is familiar with what has been done previously, that is with the history of operation of the kiln for a considerable period.

If, however, the fire by some chance is allowed to get too high in the kiln, so that the temperature of gas becomes much higher than normal, this may be corrected by gradually lengthening the draw, and by increasing the amount of each draw until the fire has reached the proper position. On the other hand, if by chance the fire is too low in the kiln, this may be corrected by shortening the draw, or by skipping a draw, so as to allow the fire to burn upwards at a greater rate than the lime is drawn.

If the fire is uneven, this may generally be traced to separation of the limestone and coke, or to the presence of either fine coke or fine limestone, or both. The remedy is obvious. In case both unburned stone and well burned lime are drawn out at the same time, this may come from the same cause.

It is impossible, however, to tell just what is the matter with the kiln unless it is properly handled and the zones are maintained fairly distinct. For convenience the kiln is divided into three zones. The upper part is the heat zone in which the coke has not yet caught fire, and in which the gases of combustion pass through the body of the stone and coke, and a portion of the heat is thereby absorbed by them. The combustion zone is the portion between which the coke takes fire and all the coke, or at any rate the greater portion of it, is completely burned. The cooling zone is at the bottom of the kiln, commencing at the point at which combustion is complete. It should contain completely burned lime, ranging from a good red heat down to a completely cold condition.

To correct poor or uneven distribution in the kiln, it is possible at times to draw the lime in a peculiar manner to counteract this tendency. If the kiln is much hotter on one side than on the other, it helps to equalize conditions to draw a greater amount of lime from the cooler side.

The presence of oxygen in the kiln gas is an indication of air leakage at some point between the combustion zone and the gas pump, and the amount of air which has leaked in may be found by multiplying the percentage of oxygen by five. Thus, the presence of 3 per cent of oxygen would correspond to 15 per cent air leakage, which may be considered excessive. The effect of air leakage is to reduce the capacity of the kiln as regards the gas pump, since the air uses up gas pump capacity which could

otherwise be utilized to pump gas and produce lime. The same result will obtain if the gas is not well cooled by the time it reaches the pump, as gas expands in direct proportion to its temperature, and a given weight of gas will therefore utilize correspondingly more capacity of the gas pump at a high temperature than at a low one. To give some idea of the amount of gas which a pump has to handle, 100 tons of limestone of 96 per cent calcium carbonate, burned with 9 per cent of coke of 90 per cent carbon, with the gas cooled to 30 degrees C., and a vacuum of 1 in. at the pipe suction, will produce 4,659,600 cu. ft. of gas, or, if this amount of material is handled in 24 hours, this will amount to 3,235 cu. ft. of gas per minute. In the above it is assumed that there will be 33 per cent CO_2 in the gas. If the percentage of CO_2 is lower, the amount of gas will be correspondingly greater.

If for any reason it is necessary to slow down a lime kiln, all that need be done is to reduce the speed of the pump as much as is required, and to draw less lime in proportion to the reduced speed.

In case of a breakdown of the gas pump, the kiln may be kept in operation by opening the top so as to permit of natural draft, and by drawing lime only in proportion to the travel of the fire upwards. It is very difficult to put out the fire in a lime kiln.

Talc in Fire-Resistant Paint

New Market of Importance for Talc

By Raymond B. Ladoo
(Mineral Technologist, Bureau of Mines)

THE INCREASING REALIZATION of the fire hazards involved in the use of wooden shingles caused the National Lumber Manufacturers' Association to begin some five years ago a search for a suitable fire-resistant paint. The problem was submitted to the Educational Bureau of the Paint Manufacturer's Association of the United States and work was started by Mr. Henry A. Gardner at the Institute of Industrial Research, Washington, D. C., in collaboration with Dr. Herman von Schrenk, a timber expert of St. Louis.

The results of this work have been described by Heckel, in "Asbestos" (Heckel, G. B., Asbestos in the Paint Industry, Asbestos, Vol. 2, July, 1920, pp. 5-10), who gives the following formula for one of the colors as typical:

63.7 Per Cent Pigment

10.60	pounds basic sulphate white lead
11.00	pounds zinc oxide
33.00	pounds asbestine (magnesium silicate)
.50	pounds borax
.90	pounds dry lamp black

36.3 Per Cent Vehicle

24.00	pounds linseed oil
2.00	pounds liquid dryer
10.00	pounds mineral spirits
100.00	

It will be noted from this formula that "asbestine" forms 33% of the total liquid pigment by weight or 51.8% of the solid constituents. Heckel in the article referred to describes this paint as "asbestiform" and assumes that since "asbestine" is magnesium silicate it must be the chrysotile variety of asbestos. "Asbestine," however, is not asbestos but is a trade name for a fibrous variety of talc mined in the Gouverneur district, St. Lawrence County, New York. This rather natural error persists through the article and credits asbestos with many desirable properties which are characteristic of talc.

Heckel continues:

"While the tendency of paint manufacturers during the past decade has undoubtedly been to curtail the high percentages of inert pigments formerly common, there is no doubt that recognition of their technical value has led to a more intelligent and legitimate use of them in many products. This is particularly true of the asbestiform type of inert pigment, demand for which has probably multiplied within the past eight or ten years. While there are available no statistics to corroborate this conclusion, it is nevertheless a fact familiar in the industry; a fact which is further substantiated by the common appearance of the term 'asbestine,' or 'magnesium and aluminum silicates on formula labels. In prepared paints of all types it appears to have won general favor; while for the other uses indicated at the beginning of this paper, other types of inert pigment appear to retain the preference.

"The prevailing percentage of 'asbestos' in high grade paint formulas averages about fifteen per cent, regardless of color, indicating that the pigment is introduced because of its physical qualities rather than at a diluent or cheapener.

"The only practical objection I have ever heard advanced against this type of pigment was, again, due to its form. The slender fibers are said to have a tendency to 'up-end' themselves, forming a minutely rough surface. I have noted this effect myself in connection with several tests, but hardly regard it as a serious practical defect.

"In conclusion, an inert pigment of this type would appear to leave nothing to be desired on the score of chemical stability, while possessing, from its form, certain valuable properties belonging to it alone."

Diller (Talc and Soapstone, Mineral Resources, 1912, U. S. Geological Survey, p. 14) says "Some of the large producers have one or more trade names, such as 'verdolite,' 'asbestine,' 'agalite,' and 'talclay,' by which their special products are known in the market, but all these products are included under 'commercial talc.'"

Another fact brought out in Mr. Heckel's article, confirming recent experience of talc producers in New York, is that the fibrous variety of talc, contrary to popular belief, is not always most desired by paint manufacturers. It is true that in certain types of paint fibrous talc is an advantage, but in other types it has the disadvantage referred to above in addition to being too bulky for its weight. "Heavy," granular talcs are often specified by paint manufacturers as distinguished from "light," fibrous talcs. Practically all talcs are fire-resistant and it seems probable that many of the talcs on the market today could be used in this new paint.

The importance of this new use, as Heckel points out, is evident from the fact that "The copyrighted title 'Pamak' was given to the line and some fifty manufacturers were licensed to manufacture and sell it, under rigid specifications, using the Association's trademark. The Lumber Association has been enthusiastic in its endorsement of this product, which will probably be pushed vigorously as soon as final decision on its classification has been made by the Underwriters' Laboratory, where it is now under test."

This should afford talc producers a new market of importance, but it can only be won by removing the erroneous opinion held in some quarters in the paint industry that "asbestine" is ground asbestos. As noted in previous articles, all talcs should be tested by a uniform series of tests and the properties of talc made known to the general consuming public.—Reports of Investigations, U. S. Bureau of Mines.

Practical Chemistry for Lime and Cement Manufacturers

XVI—The Valuation of Coal for Steam and Kiln Purposes

By Richard K. Meade, M. S.
Consulting Chemical and Industrial Engineer, 11-13 E. Fayette St., Baltimore, Md.

TO THE MANUFACTURER, coal means power to drive his machines, and to heat his furnaces and kilns; to the metallurgist, carbon to reduce his ores to the metallic state; to the chemist, heat to evaporate his solutions and complete his chemical reactions and to the ordinary individual light at night and warmth in winter. For all of these purposes, it owes its value to its elements, carbon and hydrogen, and consequently the larger proportion of these present the greater heating value the coal will have. Sulphur is present in coal in quantities ranging from a few tenths of a per cent. up to several per cent., but the gaseous products of its combustion are objectionable in almost every instance, so that while it adds to the heat produced by the coal its presence may be said to be undesirable.

For the generation of steam or the burning of lime or cement and the production of heat, the most important qualification for coal is the heat it will produce when burned. This is usually expressed in terms of British thermal units per pound.

The value of coal is also sometimes expressed in the number of pounds of water a pound of it will evaporate. Since it takes 965.7 B.t.u. to evaporate one pound of water at 212°F. to find the theoretical evaporation of the coal, it is only necessary to divide its total heat units by 965.7. This result will be pounds of water the coal will evaporate.

The American Society of Mechanical Engineers has adopted as the unit of horsepower developed by a boiler, 34.5 pounds of water evaporated per hour, from a feed water temperature of 212°F. into dry steam of the same temperature. This will of course be equivalent to 34.5×965.7 or 33,317 B.t.u. per hour. The quantity of coal theoretically necessary to develop a horse-power hour may therefore be found from this by simple proportion, thus: B.t.u. per pound: 33,317 : : 1: quantity necessary to produce one horse-power hour.

These are two ways of arriving at the heating value of coal now generally in use and a third has recently been proposed. They are (1) Direct determination by ascertaining the rise of temperature produced in a known weight of water by the combustion of a known weight of coal. (2) Calculation from the results of an elementary analysis which gives us the percentage of carbon, hydrogen and oxygen in the coal.

(3) Calculation from the percentage of moisture, ash and sulphur found by proximate analysis.

Of these three methods, the first is of greatest accuracy, but requires an apparatus known as a coal calorimeter, of which several are in the market. Of these the simplest is the one devised by Prof. S. W. Parr, of the University of Illinois, which has been mentioned.

The calculation of the heating value of coal from its ultimate analysis is simple and gives fairly accurate results. The analysis itself, however, is long and tedious and requires much apparatus. The calculation from the proximate analysis is quite easy, the apparatus is small, and the methods of making the analysis simple. Both methods of calculation will be explained further on.

While it is true that the efficiency of coal depends upon the heat units it is capable of producing, still the number of these units which will be utilized will depend upon the efficiency of the boiler or kiln in which the heat is to be transferred. For this reason it is not always economy to use the coal capable of generating the greatest number of heat units, but rather that which is most suitable to the particular style of boiler, kiln, firing, etc., under which it is to be burned.

For determining the suitability of coal for a given purpose, a proximate analysis is most useful, that is, a determination of its moisture, volatile combustible matter, fixed carbon, and ash. From the result of such an analysis, coal may be classed under the following heads according to the percentage of volatile and combustible matter it contains.

Class	Volatile Combustible Matter
Anthracite	Below 8 per cent
Semi-Anthracite	8-13 per cent
Semi-Bituminous	13-25 per cent
Bituminous	25-40 per cent
Cannel	Above 40 per cent

Of these classes the semi-bituminous coals are the most valuable as steam coals because of the fact that they kindle and burn rapidly. When burned they give off a great quantity of heat and can always be relied upon to keep up an intense and free burning fire, requiring little attention and easily kept clean and in good condition.

For heating lime or cement kilns the bituminous coals are most desirable. The high volatile coals are particularly adapted to burning in the pulverized condition and for use in gas producers.

The tendency of coal to produce smoke increases with the volatile matter which it contains. Anthracite coal is practically smokeless and from this point on, the more volatile matter the coal contains the more smoke it is apt to produce on burning. In spite of the prevailing impression as to the great loss of combustible matter due to smoke it is a fact proved by many experiments that the actual waste is generally comparatively insignificant.

For the burning of coals high in volatile matter, however, (those containing more than 20 per cent), it is necessary to have a hot furnace chamber. This is generally the case in a plain grate-bar furnace with a fire-brick arch thrown over it. For coals very high in volatile matter, special furnaces are designed. One of the best methods of burning this class of fuel is in the pulverized condition. Indeed, this class of coal which is usually cheaper than the semi-bituminous steam coal and answers the purpose fully as well, is the one generally burned in the powdered state.

Practically all coals are hygroscopic, that is, they absorb moisture on standing in the air and if this is driven off by heating, they will re-absorb it. The moisture coal contains is not merely objectionable from the fact that it takes the place of combustible matter, but also because this moisture or water must be raised to 212°F. evaporated into steam and the steam raised to the temperature of the escaping chimney gases. This requires heat, and consequently deducts from the heating value of the coal the amount of heat necessary to convert this amount of water into steam at the temperature of the stack. That this is a considerable quantity can be imagined when it is understood that it takes 965.7 B.t.u. to evaporate one pound of water to 212°F into steam.

In the same manner, the loss due to ash is not simply because the ash takes the place of combustible matter, but that the ash has to be taken from the grate in a more or less heated condition, carrying off heat units (generated by the carbon and hydrogen) with it, that it also carries with

it more or less unconsumed carbon, capable of generating heat units and that its presence clogs up the furnace, hindering complete oxidation of the carbon and hence preventing the development of the full number of heat units of which this element is capable, as carbon burning to carbon monoxide only develops 30 per cent of the heat developed on burning to carbon dioxide.

In valuing coal from its analysis it will be found convenient to strike a balance something like this:

	CR.	
Number heat units 100 lbs. of coal are capable of producing as found by the calorimeter, or by either its ultimate or proximate analysis. (Since the ultimate analysis and calorimeter determination are both made upon dry coal, these results must be calculated to 100 pounds of wet coal. Thus if the coal contains 7% moisture, 100 lbs. of wet coal are therefore equal to 93 lbs. of dry coal. Hence if 1 lb. of dry coal develops 14000 B.t.u. 100 lbs. of wet coal would develop 14000 by 93=1,302,000 B.t.u.		1,302,000
	DR.	
Heat required to evaporate the moisture in 100 lbs. of coal as it comes to the boilers. It is sufficient for ordinary purposes to assume that it requires 1200 B.t.u. to evaporate and raise one pound of water to the stack temperature. Therefore to raise 7 lbs., 7 by 1200 will be required	84,000	
Heat carried off by the ash due to unconsumed carbon. This latter ranges from 10% to 60% of the ash. Assuming the coal to contain 10% ash and this ash to carry away 15% of its weight of carbon. Thus the carbon carried off by the ash =15 by 0.1=1.5 lbs. And since 1 lb. carbon generates 14540, 1.5 lbs.=14540 by 1.5=	21,810	105,810
Balance, Credit		1,196,190

To the price of coal delivered at the boiler-house must be added the cost of removing the ashes. If the coal costs $2.50 a ton delivered and the ashes 25 cents a ton to cart away, then the cost of carting the ashes away will be 2000×0.115 (since ash carries off 15% carbon, 10% ash would be increased to 11.5%) = 230 lbs. = 2.9 cents. Hence total cost of a ton of coal will be $2.53.

Now 100 lbs. of coal would cost us 100 by 2.53 / 2000 = 12.65 cents and 1,000,000 B.t.u. would cost us (1,196,190 : 1,000,000 :: 12.65 : X, or X = 10.58) 10.58 cents. In this way we can compare two coals.

Below will be found directions for sampling coal in order to obtain a fair representation of the quality of the pile or car.

Sampling

If the coal to be sampled is in a car, a good plan is to go down the middle of the car, taking a scoop-shovel full every yard from end to end by driving the shovel down vertically and bringing out all the coal it will hold. Then go across the middle of the car, taking a shovel full every foot from side to side. This will give a sample of from 150 to 200 lbs., or possibly more. Spread the coal on a tight floor, crush all lumps to the size of an egg and mix thoroughly, quarter down to about 25 lbs., crush to marble size, and again quarter down to about 10 lbs. This sample should then be brought down to ¼-in. size and quartered to 2½ lbs., placed in a fruit jar, sealed up tight and taken to the laboratory. If the sample is damp or contains much moisture, a determination of moisture should be made in this sample without further grinding, as directed under "Proximate Analysis." The rest of the sample may be then ground finer, quartered, again ground, etc., until finally 100 grams are obtained ground fine enough to pass a 100-mesh sieve.

The grinding must in all cases be quickly done to avoid changes in the moisture content of the coal and the final sample should be promptly analyzed and kept in an air-tight bottle or jar.

In every case the sampler must to some extent use his own judgment, taking into consideration the following principles: (1) The sample must be large enough to be representative. With anthracite coal broken to pea or buckwheat size, a smaller sample will represent an average than will be the case with bituminous coal in large lumps. (2) The proportions of fine and coarse material must be the same in the uncrushed sample that they are in the car or pile of coal. (3) The proportions of heavy and light particles must be the same. (4) The sample must contain the same amount of moisture as the large body of coal. (5) The sample must be crushed rapidly. (6) The analysis should be promptly made as pulverized coal is liable to undergo oxidation and change of composition on standing.

(To be continued)

Lime Sold to Chemical Manufacturers in 1918

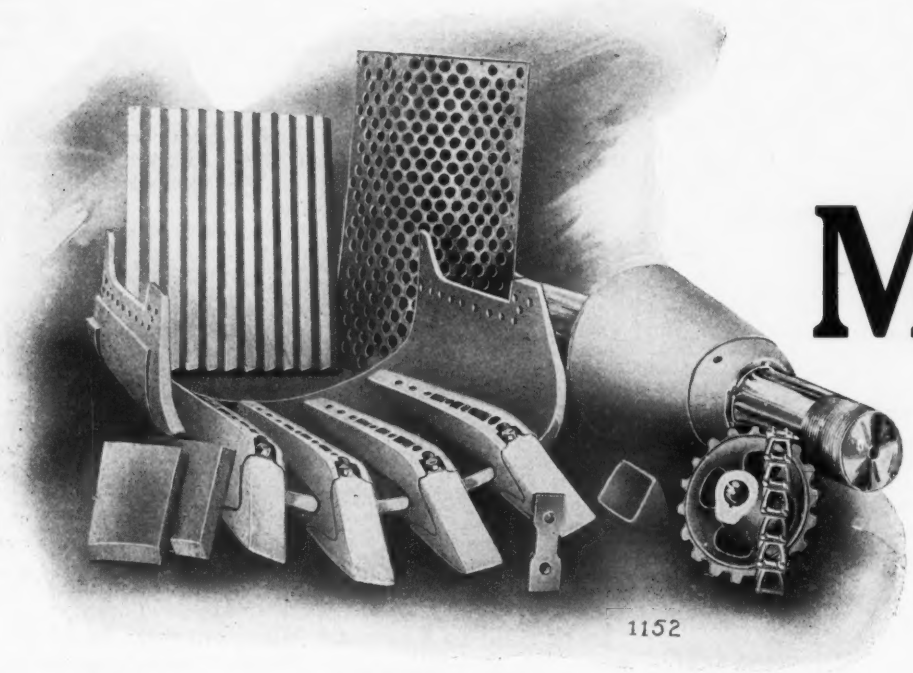
Use	Quantity (short tons)	Value
Alkali works	145,031	$ 768,570
Potash salts	176	1,409
Ammonia works	13,975	99,831
Explosives (kind unspecified)	23,735	173,129
Nitrates and glycerine	2,059	12,468
Guncotton preparation and gelatin	10,755	88,784
Acids	38,388	298,660
Cyaniding	12,512	118,274
Calcium carbide	87,434	785,912
Alcohol:		
Dehydration and manufacture of	1,535	10,638
Wood distillation	13,986	121,678
Bleaching works	37,905	306,726
Phenol	25,002	196,463
Salt refining	1,791	13,388
Coal and water gas purification	171	1,959
Coke-oven by-products	23,451	174,437
Gas-plant by-products	2,371	19,309
Undistributed*	4,481	32,966
Unspecified	120,774	952,701
	566,532	$4,177,302

*Includes lime sold for use in manufacture of calcium acetate, aluminum hydrate, barium products and precipitated calcium carbonate.

Lime Sold for "Other Uses" in 1918

Use	Quantity (short tons)	Value
Refractories	318,896	$4,097,819
Silica brick	26,517	182,659
Sand-lime brick	7,417	59,357
Soap	29,599	202,028
Lubricating grease, renovating of butter, etc.	3,395	202,410
Kalsomine	999	9,076
Water purification and softening	75,448	596,667
Sewage purification and neutralization of acid water	9,514	68,668
Disinfectants	6,059	51,438
Glue manufacture	8,822	78,599
Pottery and porcelain manufacture	129	1,213
Polishing and buffing compounds	384	4,424
Cotton, thread and woolen mills	2,117	21,425
Flour mills	164	1,785
Spraying	1,813	16,706
Undistributed*	7,790	56,621
	499,063	$5,476,895

*Includes small quantities of lime reported as sold for manufacture of candles, corn products, dyes, rubber, proprietary medicines, varnish, graphite, for refining gold and platinum, for use in slag cement, in print works, tobacco factories, copper and file works, for sheep dip, and other uses not specified.



In the illustration is shown a steam shovel dipper front equipped with Panama reversible dipper teeth for a 2½-yard dipper. Similar fronts and teeth with other steam shovel parts of manganese are also made for any and all makes and types of dippers. The manganese crusher parts shown include a jaw plate, screen plate, crusher head, concaves or staves, and hammers for rotary pulverizer

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1211 Citizens Bldg., Cleveland

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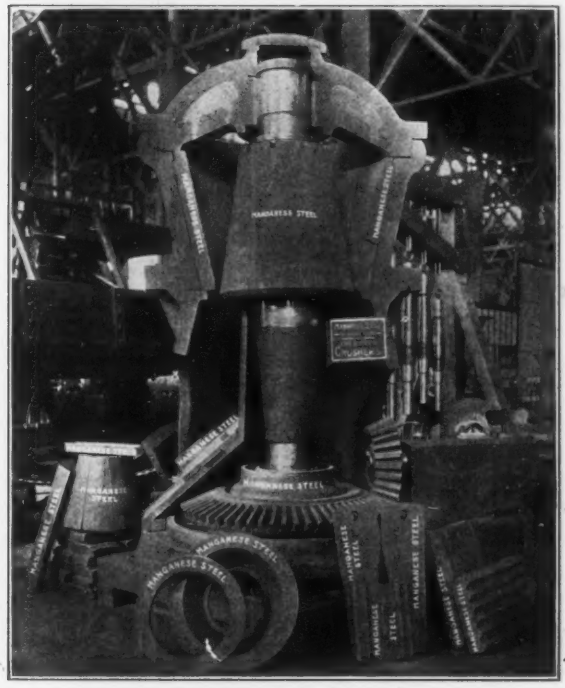
TISCO Manganese Steel Two-Part Panama Dipper Teeth

Patented May 19, 1908 Patented June 1, 1909

The Panama Reversible

Get our attractive Free exchange proposition. This tooth saved years of time and millions of expense in digging the Panama Canal.



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WE HAVE PATTERNS FOR ALL STANDARD CRUSHING AND ROCK HANDLING MACHINERY.

New Ground Storage System for Dewey Portland Cement Plant

Quarry Operation in Wet Weather Avoided by Unusual Material Handling Installation

THE DEWEY PORTLAND CEMENT CO., Dewey, Okla., gets all of its raw materials from a single quarry. This quarry is about 2½ miles from the cement plant. The overburden is from 18 in. to 3 ft. of clay, which is only partially removed in the stripping operation. At places in the quarry there are also clay seams in the limestone formation. Other parts are hard and clean stone.

The face of the quarry varies in height from 12 to 25 ft. This face is roughly circular in form and is operated with three steam shovels of the locomotive type—one 90-ton and two 60-ton models. These shovels are so distributed about the quarry face as to be working in different kinds of materials—high lime, high clay, and an average between these two. Stripping is done with a 30-ton steam shovel.

The quarry transportation system consists of standard gauge tracks, steam locomotives and 8-ton side-dump cars. The cars are brought to the crushing plant at the cement mill in trains and then hauled up a cable-operated incline and dumped as separate units.

The crushing plant is designed more as a commercial crushed-stone producer than the ordinary cement crushing plant. The quarry cars are side-dumped into an apron feeder, which regulates the flow of material to the primary breaker—a 48x66-in. Fairmount roll crusher.

The run of the quarry is reduced in the primary breaker to about 3-in. size. It is then elevated by a large steel pan elevator to a 84-in. by 20-ft. sizing screen, where the cement mill stone is separated from the commercial sizes of crushed stone.

Ordinarily the fine material is used by the cement plant. This is collected from the first section of the screen, and of course includes all the clay and limestone dust. The end of the screen is then used to produce the commercial sizes. The rejections go to a roll crusher and are returned to the same screen.

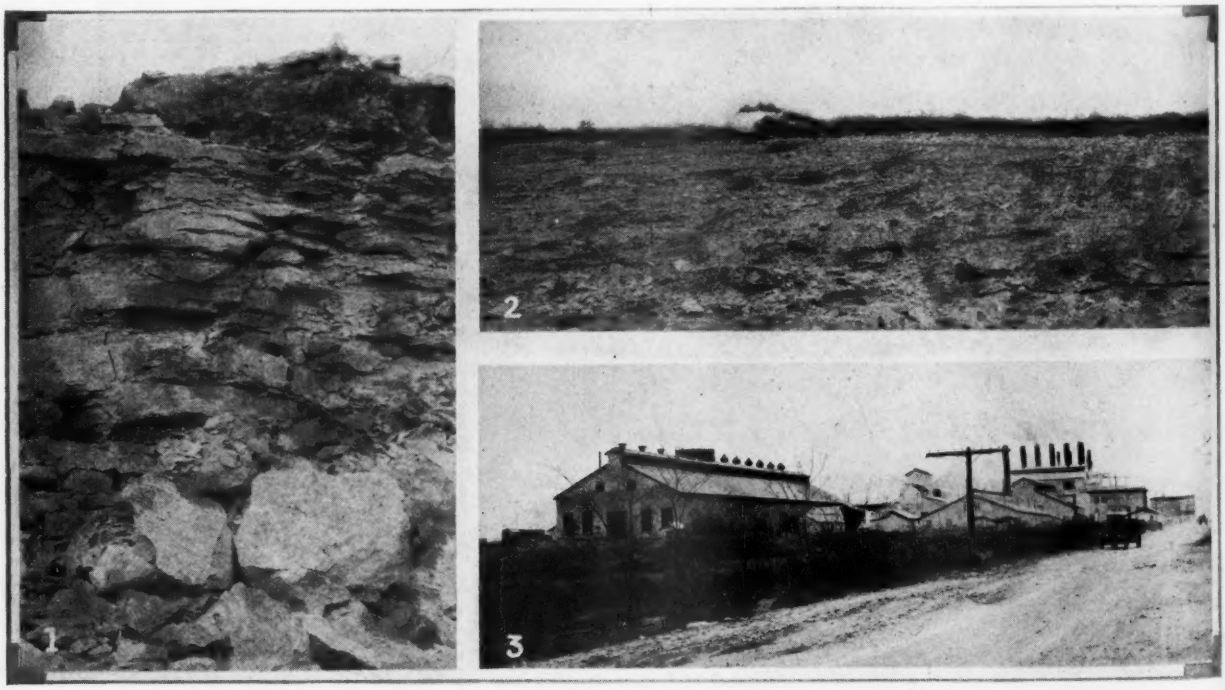
This plant makes about 500 tons of commercial crushed stone daily in addition to the stone needed by the mill. The crushed stone of commercial sizes is sent either to the commercial stone bins or is used for cement rock as the occasion requires.

The fine material collected in the first section of the screen is below a cement mix in lime content, consequently some of the commercial sizes of limestone must be used in proportioning the mix.

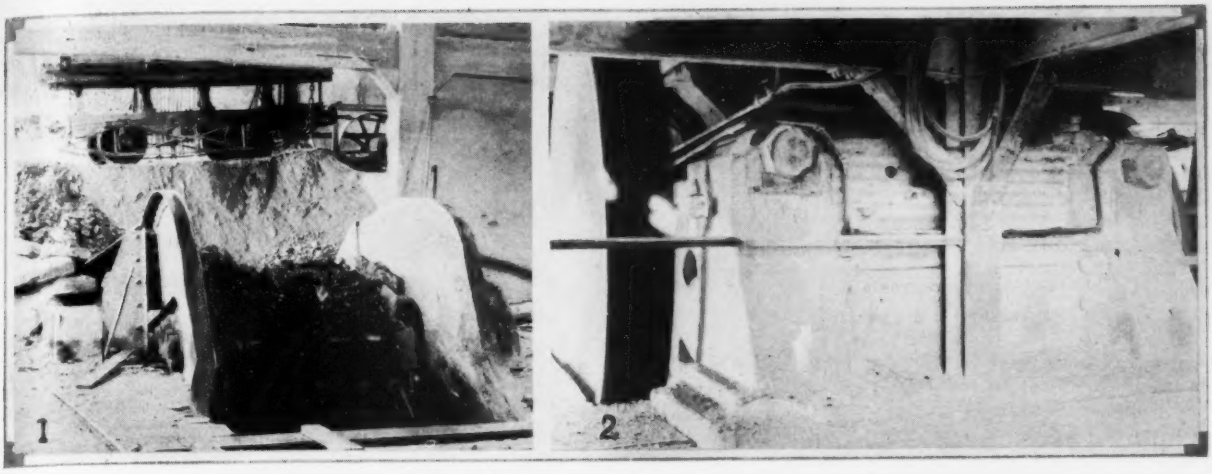
New Ground Storage System

In previous years much difficulty has been met with in the crushing plant during wet weather, as the presence of the clay in the material fed to the crusher considerably reduced its output. This condition has sometimes been so serious as to reduce the output of the cement plant, owing to the inability to crush the raw materials fast enough. To avoid this difficulty the extensive storage plant shown in the accompanying views was devised. Now during wet weather the quarry is no longer operated, the material supply for the cement plant being drawn entirely from storage.

After the crushed stone has been



Views 1 and 2. Quarry from which both limestone and clay are derived. 3. Plant of the Dewey Portland Cement Co., Dewey, Okla.



Apron feeder and car dumping hopper. 2. Fairmount roll crusher as primary breaker

screened and sized there are three possible paths for it to take, and two paths for the screenings or clay material. The cement stone, or screenings, dependent upon the position of a gate in the chute from the screen, may go either to the mills or to storage. The commercial crushed stone sizes after leaving the screen may either be loaded out directly as commercial stone, be sent to the cement mill, or be sent to storage.

The materials for storage are taken by two belt conveyors, which run out on a reinforced concrete trestle over ground storage piles. These belt conveyors are equipped with automatic trippers so that they can be discharged at any point. The cement stone, or the screenings high in clay, are discharged by one conveyor on one side of the trestle and the high calcium, commercial crushed stone by the conveyor on the other side of the trestle.

To withdraw the materials from this ground storage the same belt conveyors are used. Instead of the automatic trippers, traveling hoppers are used. These hoppers are fed by a locomotive crane with a clamshell bucket, operating from a track on the trestle, between the two belt conveyors. This arrangement permits the one crane to load material out of the storage piles on either side of the trestle. The belt conveyors are of course run in the opposite direction when taking material from storage to mill, than when taking material to the storage piles.

The materials taken either from the screen chutes or storage is conveyed to two reinforced concrete cylindrical storage bins or tanks, from which the material is taken out for the three coal-burning dryers. One bin is ordinarily used for high lime material and one for low lime material. Of the dryers, one is ordinarily used for the high lime material and one for the low lime material, the one in the middle being the high lime material dryer.

Each dryer feeds a cylindrical concrete bin. The raw materials are proportioned

New concrete trestle over ground storage system

View showing storage and connections with cement mill

Reinforced concrete belt conveyor gallery

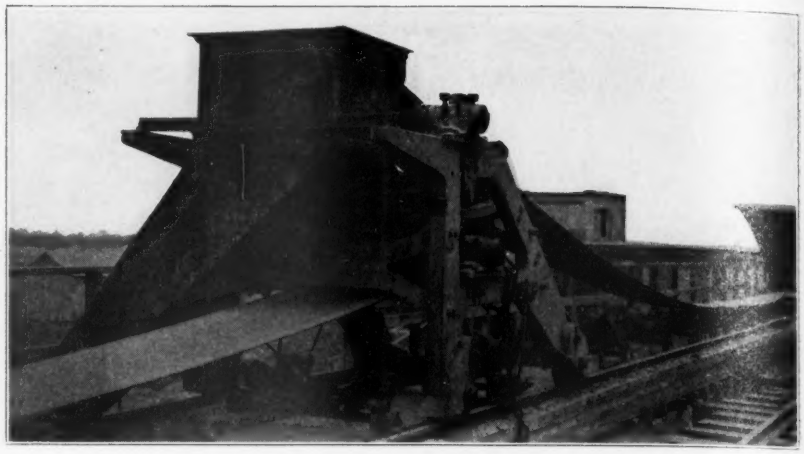
by drawing on the middle high lime tank to make up the lime deficiency in the material drawn from the two outside tanks.

In reality the proportioning starts in the quarry from the location of the shovels. The chemist must know daily in what part of the quarry the shovels are working and prevent the delivery of too much low lime material, or at least see that sufficient high lime material is delivered to make up the deficiency in the run of the quarry. The proportioning previous to the preliminary grinding is done at the bins following the dryers, as mentioned. Here scales are provided and weighed amounts of material are drawn from the adjoining bins.

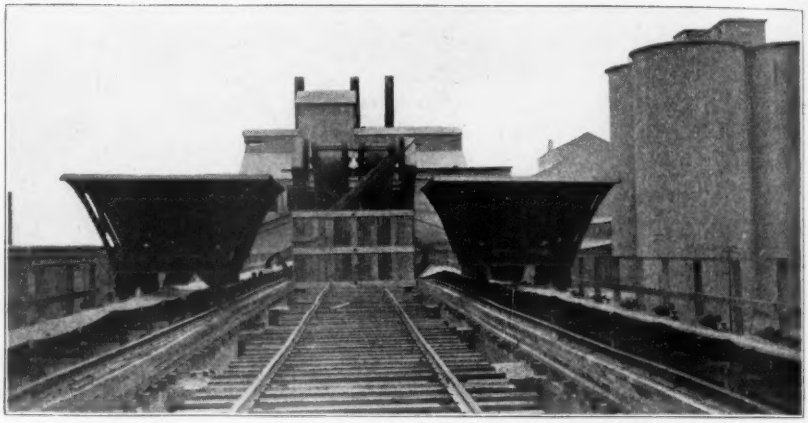
This material is sent to a battery of kominuters. Following these are automatic sampling machines which take samples every 70 seconds. From the results of the analyses of these samples, the material is directed to any one of five bins, from which the final proportioning for the tube mills is done.

The dry process of manufacture is used, using five 7x100-ft. rotary kilns. Pulverized coal is used for the kilns, but the power plant of this cement mill is unique in using large gas engines. These were originally installed because of the abundance in this locality of natural gas, but the supply of gas is rapidly running low.

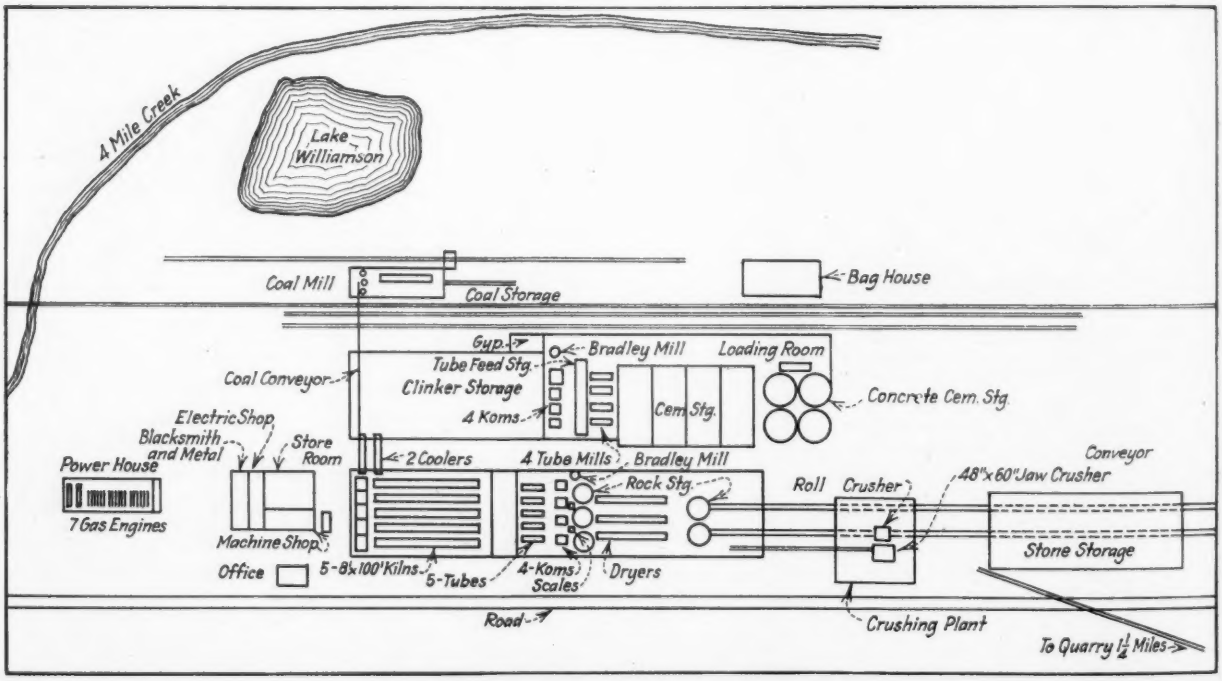
The president of the Dewey Portland Cement Co. is Frank E. Tyler, the vice-president and sales manager F. L. Williamson, Kansas City, Mo., the secretary is J. H. Keith, Coffeyville, Kans., the treasurer S. F. Hughes. Topeka, Kans., the chemist P. R. Chamberlain, and the superintendent Wm. Fowden, of Dewey.



Unloading trippers of trestle storage



Traveling hoppers for recovering materials from storage and loading belt conveyors for return to plant. Center track is for a locomotive crane



Plan of the plant of the Dewey Portland Cement Co.

The Abandoned Slate Quarries at Arvon, Mich.

Wherein Poor Management and Lack of Confidence Disqualifies a Profitable Business in Slate

By L. D. Tucker
Upper Peninsula Development Bureau, Marquette, Mich.

JUST AS LONG as the fortunate few shall continue to reap the harvest from the wild, almost fanatic gambling instinct of the human race—that seemingly uncontrollable desire to speculate—just that long will the proven "sure thing" fail to attract. And, while hundreds of thousands of American citizens annually lend an eager ear to the roseate tale of the "wild-cat" promoter, opportunities as substantial and glowing as the Creator could possibly have made them stand idle, and, yes, begging for a chance to prove up.

It is doubtless the Yankee craving for the novel and spectacular which has resulted in the misuse, or non-use of much of the vast natural resource for which the United States of America is known and recognized the world over. So intense is the desire of the masses for something new, something different, that the slower, yet more secure, method of attaining success and independence is a matter of after-thought entirely.

And so it is that, with the country's economic situation frantically calling for greater utilization of the nation's vast natural resource in soils, minerals, waterways and timber, money goes on, circulating from one fly-by-night scheme to another, each promising wealth and opulence.

There are any number of striking evidences of this fact throughout the country. We see it on all hands—abandoned mines, mills and factories—left to rot and decay because the first turn of the wheel failed to net the expected fortune. And it is a safe assumption that 80 per cent or more of these idle properties represent the lack of proper management—and that alone.

So, with contractors and builders wildly casting about for a way out of the constantly increasing cost of construction materials, there lies embedded in the surface of Baraga County, upper Michigan, what has generally been acknowledged among geologists as one of the finest and largest deposits of commercial slate in the entire country. There have been attempts to market the product—and the crumbling shacks, rusted machinery and water-filled pits, at Arvon, the site of the old slate quarry, is the almost sickening evidence of the failure on the part of the original operators to make it a go.

A visit to the abandoned village of Arvon, upper Michigan, inspires one more with a sense of pitiful awe than with a feeling of resentment or denouncement towards those whose lack of proper managerial ability resulted in the failure of operations there years ago. Scenically, it is an unusually attractive spot.

Hewed from the great forest of hardwood timber which abounds throughout that region, and approached by a winding trail, hemmed in on both sides by tall hemlocks, Arvon is picturesque in the extreme. There are, or were, 14 dwelling houses and a two-story hotel, which is said to have cost a bit over $10,000 to build. Erected about 50 years ago, the hotel is still in an excellent state of preservation, with its Arvon slate roof intact, but the dwelling houses are in an advanced stage of decay. A caretaker, who is mayor, village council, fire department and police, is the only resident of Arvon.

Slate was first discovered in Baraga County in 1872, and the Huron Bay Slate and Iron Co. was organized in the fall of that year. Work was begun, and a tramway erected to Huron Bay, where a dock was later constructed to accommodate boats of 14-ft. draft.

The lack of experience and disruption within the management itself resulted in the abandonment of the work in 1877, after having operated during that period at a constant loss. Previous to the year 1878, 5100 squares of roofing had been shipped, a square, in this sense, being 100 sq. ft. During the year 1878, 1535 squares were sent out.

In 1874 another slate company, the Clinton Slate & Iron Co., took up the work near that vicinity, and in four years shipped out a total of 3084 squares of roofing slate. This company, likewise, failed, and their operations were taken over by the Michigan Slate Co. in 1881. The officers were James Turner, W. K. Prudden, S. F. Seager and S. L. Smith, of Lansing. With a capital of $500,000 the new company began operations—and the abandoned village of Arvon is the result of their seven years of work in that vicinity. During that period 48,000 squares of roofing, valued at $188,550, or $3.93 per 100 sq. ft., were shipped.

That the deposit possesses a high commercial value is attested by a report of Michigan's mineral resources, issued several years ago by the State Geological and Biological departments, which says: "The roofing slate which was sent out from the quarries at Arvon is of an agreeable black color and of uniform quality. The grain is fine, silky, homogeneous and combines durability with smoothness, bearing favorable comparison with the product from the East. Cleavage or splitting planes of the slate dip very uniformly to the south, but the bedding plane is in broad anticlinal and synclinal waves which trend east and west, with a consequent dip to the south or north, as the case may be."

A. P. Swineford, commissioner of mineral statistics during the period when the Arvon quarries were in operation, declared: "The time is near at hand when the slate interest of Baraga County will come to the front and take rank as one of the most important of our Michigan industries. Indeed, all that is now needed to make it a permanently profitable industry is the employment of the capital, backed by intelligent management, necessary to its thorough development."

Recent investigation of the slate possibilities at Arvon have been made by the State Geological and Biological Survey, and in a recent statement, R. A. Smith, director of the survey, declares: "In answer to numerous inquiries from asphalt shingle manufacturers I have always suggested the use of the black slates at Arvon for making a rich, dark shingle, for I believe that such a shingle would be salable."

Further in his report, Director Smith declares:

"The operators evidently did not understand the geology of the slate deposits and inferred that the cleavage planes were bedding planes. As a consequence their quarries were planned wrong and the results of their operations now form a serious obstacle to the economical opening of the quarries. Personally I would like to see a combination of good business men and a practical slate operator try out the commercial possibilities of these slates."

A new company, taking hold at Arvon today, would be greeted with a distinct advantage as a starter. They would find that, while preparations for re-opening were in progress, considerable shipping could be done from the three or four substantially-built and slate-filled warehouses now standing on the property. A vast amount of roofing slate, neatly cut and piled, had been stored in the warehouses at the time of the property's abandonment—and both slate and warehouses are in excellent condition. Another shack contains hundreds of sample drill cores, taken from the pits which have been worked.

There is a possibility that if these samples could be identified with the sections from which they were obtained, much of the expense and labor attendant upon new experimental and survey work could be avoided.

At any rate the slate quarries at Arvon are idle and have been idle for the past 40 years or more. Great, gaping shelves of fine, black slate remain to tell the visitor the sad story of poor management. The pioneering, namely, the location of the deposit, the opening of the quarries and the cutting of roads and laying of rail beds, has been accomplished. It now remains for some really wise and level-headed business man, or group of men, to step in, with practical operators to conduct the work.

It is an established fact that there is almost an indefinite supply of the finest grade of slate at Arvon. And in the meantime the village of Arvon awaits patiently the day of its reclamation, the caretaker is tiring of his one-man job, and once more opportunity knocks in vain.

Progress on Eastern Potash Corporation Plant

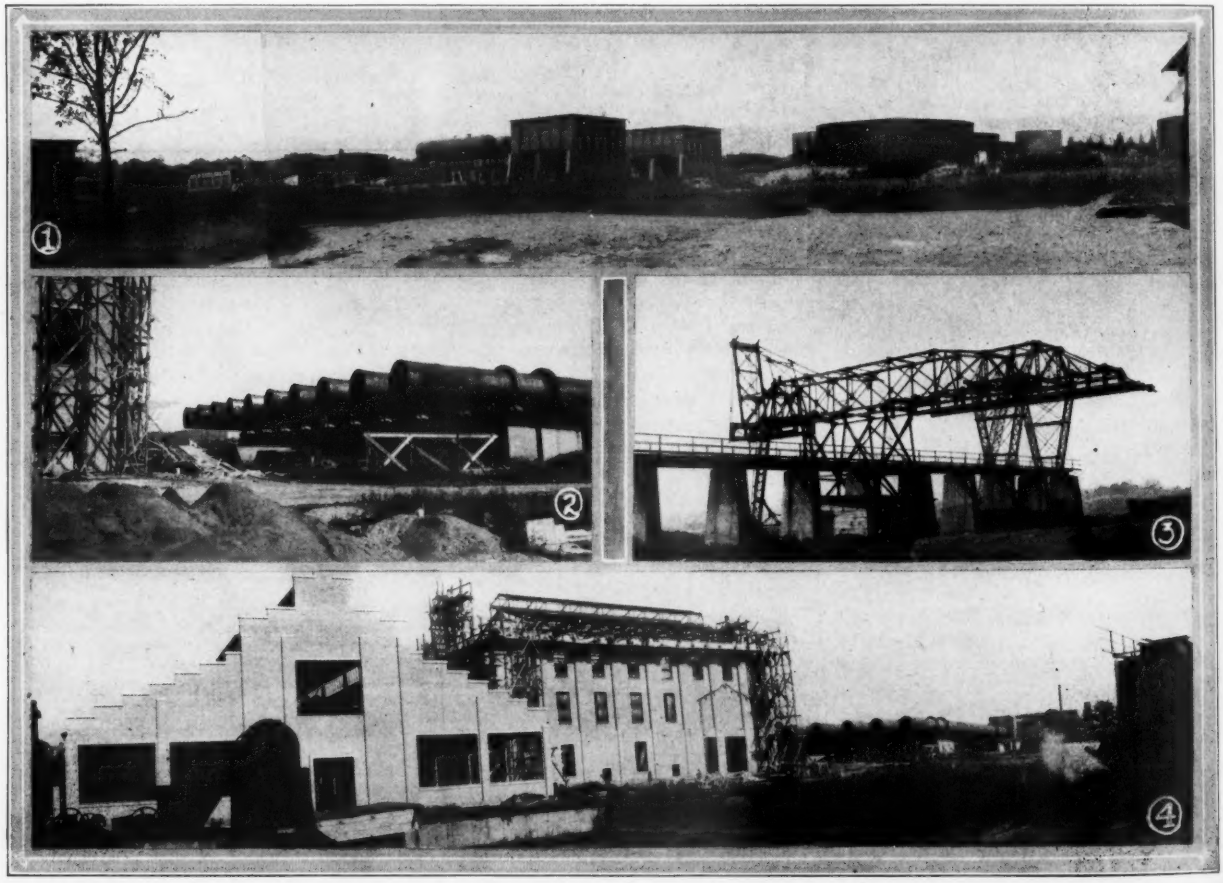
AN AMERICAN CHEMICAL industry, born of war conditions, is the Eastern Potash Corporation of New York City, whose plans for the world's largest lime plant were described in ROCK PRODUCTS just a year ago, November 8, 1919. The views below show the progress made on this plant in the past year.

The management of the company has been seriously handicapped by the death of the principal promoter and by the repudiation of its oil contract by the petroleum company which was to have supplied the crude oil, and the resulting lawsuits. These handicaps delayed the work to some extent, but both obstacles have now been overcome. The potash company has won its suit against the oil company.

A part of the plant is a petroleum refining unit, shown in the first of the following views. This plant is designed to remove some of the lighter and most saleable oils for the oil trade, and to furnish the plant's lime kiln and boilers with the heavier residues for fuel oil. It is expected that this part of the enterprise will pay for its own operation and furnish the potash plant with fuel oil at a very much reduced cost.

The lime plant will consist of 10 rotary lime kilns 8x125 ft., which are already in place, as one of the views show. There is a rotary cooler at the end of each kiln. The lime is brought back to the center building in view 4 below and used to treat greens and marl for extraction of the potash. The sand-lime residue is to be pressed into brick, which are somewhat similar to ordinary sand-lime brick. The buildings shown in view 4 are built of these brick which are now being made at an experimental plant at Jones Point, N. Y.

The Eastern Potash Corporation is a $7,500,000 concern. The president of the company is Waldemar Schmidtmann. Thomas C. Meadows is general manager. Richard K. Meade, consulting engineer, Baltimore, Md., designed the lime plant.



Construction views of the plant of the Eastern Potash Corporation at New Brunswick, N. J., taken on October 9

Reply to Criticisms of Proposed Uniform Agricultural Lime Law

Proposed Law Is an Earnest Attempt to Benefit All Parties Concerned

By Elmer O. Fippin
National Lime Association
Washington, D. C.

THE COMMENTS on our proposed uniform agricultural lime inspection law developed at a meeting of a group of manufacturers of agricultural limestone as reported in ROCK PRODUCTS, October 23, page 36, conveys several wrong impressions about the terms of the proposed law that we feel should be corrected at once.

First, let it be said that it had not been our thought to carry the provisions of this proposed law into the public press at this stage because it has not been sufficiently worked over in conference with manufacturers of liming materials and with the representatives of agricultural interests so that we are ready to say it is in the final form, for which we are ready to stand. Our policy has been to first submit it to manufacturers of all kinds of lime suitable for use on the soil, including limestone manufacturers as well as producers of the burnt product. It was in this way that the proposed form of the law was brought to the attention of the National Agricultural Limestone Association and led to the comments in hand. Now that it has gotten into the press we are, of course, concerned that correct impressions are gained by all those who are interested in this matter. We have aimed to bring about co-operation of all agencies interested in such laws so that any final form would at least represent the majority of opinion.

Some Essential Features of the Law

In considering the proposed law, it may be divided into several groups of provisions. In the first of these the various liming materials that are suitable for use on the soil are defined and along with this definition of materials is a statement and definition of terms suitable for application to the different liming materials. The second division deals with the form of the label which a manufacturer must use. The third group deals with the form of the required guarantee as to both chemical composition and physical character. The fourth division is concerned with certain exceptions and with the preparation of reports, state penalties, etcetera.

As to Definitions

The committee representing the limestone producers first criticises what they assume to be an attempt to summarize all carbonate forms of lime under one heading, while quick lime and hydrated lime are given separate and specific names. They have apparently overlooked the fact that they were dealing with that part of the proposed law (on page 2 of the mimeograph form), which defines the chemical form of the various materials that may be used on the soil.

If they will turn to page 6 of the form they will find a statement of the various names under which all of these liming materials are commonly recognized by the public and here all commercial forms are listed exclusively under their popular names and strictly on a par with each other without confusion with such chemical terms as carbonate of lime. This latter material is listed under three heads, namely, pulverized limestone, marl, pulverized mussel shells or pulverized oyster shells. So far as I am informed, this includes all of the natural carbonate forms of lime that may be used. There are, of course, certain by-products such as that from the acetone manufacturer, which are carbonate in character, and these are provided for under the general heading of "By-product Limes," together with their source-name. Their exact chemical and physical nature will appear under the provisions of the report on analysis.

No Discrimination

At another point in the discussion it is stated that emphasis is placed on burnt forms of lime to the exclusion of the various carbonate materials. We submit that a careful examination of the law will not support this statement. Our endeavor has been to approach the whole subject of lime inspection from the unbiased point of view of both the manufacturer and the farmer, to give the latter that information to which he is entitled, and which most simply and most clearly deals with the constituents and properties of any liming material that affect its value for use on the soil. At the same time it is important to be equally fair to the manufacturer of all forms of liming material as to the form of the analysis required and the conditions under which inspection is to be carried out. If at any point we have deviated from this policy, then we are open to correction.

We have closely studied all of the thirteen state laws now in effect and have also had in mind the wide experience gained in fertilizer inspection laws. We have analyzed the essential features of those laws and have endeavored to prepare a form of law including those essentials in the simplest possible terms and in the least possible technical language.

Chemical Analysis

Question has been raised about the form in which the chemical analysis should be reported. The first and most vital consideration here is that all materials be reported on one common basis, probably in terms of the constituents the farmer is concerned in buying. In commercial fertilizers the evolution has been in the direction of stating the percentage of an element present. For example, from the earlier practice of reporting phosphorus in terms of bone phosphate, we have evolved, first, to the statement in terms of phosphoric acid, and now we are beginning in several states to report only the percentage of actual phosphorus which is the one thing the farmer is concerned in purchasing. That is the primary constituent that gives its value.

Having this fact in mind, it should be recognized that the chemical analysis of liming materials may be uniformly stated on any one of four bases. First, in terms of the actual liming element, that is, calcium and magnesium. This has been adopted by the Ohio law in part. Second, the liming elements may be stated in terms of the oxides of calcium and magnesium. This is the form most commonly used in fertilizer reports and in part by most lime inspection laws, and was adopted in the initial draft of our proposed form because it was believed to most nearly represent the views of inspection officials at the present date. Third, the materials may all be reported in terms of carbonate of the liming elements, calcium and magnesium. On this basis, limestone and marl would range from 100 per cent down, while burnt forms of lime would have a carbonate equivalent ranging from 179 per cent down, depending upon their purity. Fourth, the materials may be reported in the terms of their calcium carbonate equivalent, which means that magnesium carbonate would be translated into its equivalent of calcium carbonate in acid

neutralizing strength. That plan has been adopted in the Ohio law and the law of some other states. This implies that the one factor of a liming material that gives it value is its capacity to neutralize acid. We believe that in light of the best investigations at several institutions that there is serious question as to the accuracy of this claim. First, because the liming elements appear to perform several other important functions in improving soil fertility and crop growth which are independent of acid neutralization, and in these functions magnesium does not seem to play as important a part as calcium. In the second place, the range of chemical activity of the two elements in the soil is not the same and there is much indication that the advantage is in favor of the calcium constituents, at least they are on a par with equal weights of magnesium.

While we have put into our proposed law the statement of liming materials in terms of the oxides of calcium and magnesium, our preference is for the analysis in terms of the element itself, that is calcium and magnesium, as adopted in part by the Ohio law. To our mind the first essential of fairness to the farmer is that all liming materials be reported on the same basis of analysis and whichever one of the first three above methods seems to have the largest support will have our approval, at least until we have evolved further in dealing with such matters. But to report one material on the oxide basis and another material on the carbonate basis of percentage purity is too thoroughly misleading and confusing to the farmer. Further, we believe that no informed man will contend that the carbonic acid in a liming material has value in the soil. It is pre-eminently the lime elements, calcium and magnesium, the farmer is interested in buying, and when liming materials are presented to him on the carbonate basis, the information is camouflaged in exactly the same way that some manufacturers of commercial fertilizers formerly camouflaged their percentage of phosphorus by stating it in terms of bone phosphate, which made the proportion look at least twice as big as when presented in terms of phosphoric acid, and about four times as big as when reported in terms of phosphorus, the real element with which he is concerned.

Mechanical Analysis

Taking up now the form of statement of fineness of liming materials. The committee contends for the admission of screenings and the statement of analysis is in such a form as to show the maximum size of screen through which all material will pass. On this point the reader should be reminded that there is at present a wide difference in opinion as to the fineness to which liming materials should be reduced to be reasonably effective within a rotation or two. In the Middle West there has been quite a strong feeling in the past in favor of very coarse material running up to screenings of a quarter of an inch size. In the East and South, however, experience and investigations are in favor of very much finer materials, and there is now a tendency, in the Central States, to swing to finer materials. We believe that a careful examination of the best investigations at the different experiment stations show a preponderance of evidence in favor of finely pulverized material and indicating that coarse material is essentially dead weight and nearly inert in character within any reasonable period of five or ten years.

In drafting the proposed form of law we do not presume to stand as a judge between these different opinions. We call attention to the fact that a statement of the maximum screen through which a liming material will pass, especially if that screen be fairly coarse, such as a 10-mesh, gives to the man who wants only fine material no information that will guide his selection. It seemed to us that the only fair method was to present to any farmer or other person examining these facts, an actual statement of the fineness of a material showing the proportion of material of different sizes. The law, therefore, admits any carbonate material which includes limestone, which is as coarse as 3.6-mesh per inch, which certainly ought to include the great bulk of screenings. At the same time, five screens below that size have been picked out from the standard series developed by the United States Bureau of Standards, and now widely accepted throughout the country and employed by practically all screen manufacturers, upon the basis of which to report the proportion of liming material of different degrees of fineness.

In the original form of the proposed law the sizes selected are one-twelfth, one-twenty-fifth, one-fiftieth and one-one-hundredth of an inch in diameter, and the analysis would report the percentage of material which passes each coarser screen but does not pass the next finer screen. Such an analysis would enable any person to determine the amount of material in a sample of a fineness to which he would credit value. One man might include all of the groups. Another man might include only the materials passing the one-fiftieth and one-hundredth screens, but he would have essential information for his guidance which he does not have at present as a result of any state law now in effect. In other words, the purchaser is provided with the facts and is left at liberty to evaluate the various groups as he sees fit in the light of his experience and state experimental results. At the same time, such form of law would be an advantage to the manufacturer of screenings, especially to the one whose product has the largest amount of very fine material because this fact would immediately appear in the analysis.

In some quarters it has been suggested that we should also include a two-hundredth-inch screen which would show the extremely fine material. To this we are not unalterably opposed, but having in mind that the finer screens greatly increase the mechanical difficulty of carrying out the inspection law. We have been willing to omit a determination of this extremely fine material, but if there is a general feeling in favor of its inclusion we are ready to accept that change.

Co-operation Invited

We may add that the development of our proposed law is now in the stage of submission to agricultural officials for their opinions and we should hope that ultimately there might be some general conference of all these interested on the subject where any final differences might be worked out agreeably to the majority of opinion. The three big factors in this whole matter in our view are (1) the development of a form of law to which all states having such provisions can subscribe; (2) agreement as to the terms to be used in such laws; (3) the statement of analysis, both chemical and physical, of all forms of material on the same basis. We are not aiming criticisms at any particular state law. The fact that no two laws are now alike indicates the differences in views and that the essential elements have not been thoroughly analyzed. The claim that our proposed law is too technical is hardly borne out by an examination of the form, especially when compared with several of the state laws, some of which are longer and much more technical in terminology and report on analysis.

We have approached this matter from the constructive viewpoint of developing the best possible law, for all conditions and all states, and we hope that we may have the attention of that part of the public interested in these matters and their co-operation in attaining the objects we have outlined above.

Farmers Form Phosphate and Limestone Association

AT A RECENT MEETING of farmers in the vicinity of Hudson, Ill., an association of farmers was formed for the purpose of handling and keeping on hand rock phosphate and limestone. Plans were laid relative to providing storage for both limestone and phosphate, and these plans will be pushed to completion as rapidly as possible. The officers of the new association are as follows: Aura Johnson, president; M. L. Ramseyer, vice-president; Charles T. Gildersleeve, secretary, and O. W. Fuller, treasurer.

Editorial Comment

Representative Democracy

Every reader is familiar with the accomplishments of the National Coal Association. Every one doubtless realizes what a tremendously powerful factor it has been in influencing the acts of government officers which in turn have had a controlling influence on nearly all industry this year of 1920. Every one realizes the influence the National Coal Association was able to bring to bear on the Congress that passed the Esch-Cummins railway law, and how its selfish interests were taken care of without consideration of the effects to other users of so-called "coal cars."

Our politicians and statesmen are naturally guided in their public acts by certain influences (or in plain language, wire-pulling). Until comparatively recently such influences were confined to those brought to bear by three elements in our national life—farmers, laborers and capitalists. Our congressmen and senators always listen with respect to authorized representatives of the first two classes and to any individual of the last.

The experience of the National Coal Association shows that we have to deal now with a new and powerful factor in our system of representative democracy—the *national trade association*. We have a closely organized group representing a single industry exerting an undue influence in the operation of the government. Doubtless the coal men had no particular desire to do injustice to the other users of open-top cars; they sought merely to insure that their own selfish interests were taken care of. Protests were made at the time, it is true, by the sand and gravel and crushed stone industries, but these protests were weak in comparison and futile in result.

For this struggle the mineral aggregate industry should obviously have had a compact, powerful national organization—so powerful and influential that it could have commanded the assistance of every other organization in the building material and fertilizer fields, because these are true basic commodities without which no construction and no agricultural progress can proceed, as the past season proved in countless instances.

Instead the sand, gravel, crushed stone and slag industries not only lacked a truly representative national organization—and the numbers and bank roll that goes with it—but they even lacked a unity of purpose, and possibly lacked a sufficient comprehension of the problems they were facing. All this is natural, entirely excusable and is only to be regretted. But is there any longer an excuse for not having an organization equal to the task before the industry?

It may be unfortunate that our country should find it necessary to have powerful, organized groups working for selfish interests. It would probably be better for all if we thought more about the good of the nation than of the profits of our own business. But such is not the fact, and we must face facts as they are. We live in a democracy in which the various classes named are continually struggling, if not for supremacy, at least for special privilege and consideration.

The national trade association then is the means by which the ordinary business man may have his special interests brought to the attention of the members of the government—the means by which he may do a little wire-pulling for his own selfish interests. He must play the national organization of his industry against national organizations of laborers and farmers, whose number and votes constitute their political strength, and the capitalists whose money is their source of influence, and against other national organizations of selfish interests.

The ordinary producer of mineral aggregate must be prepared to do the same thing, or not only do his interests suffer, but the whole structure of the government, as a practical working organization, is unbalanced, which results in errors of judgment, errors of act and very often in injustice to the unrepresented interests and in the end to the public at large.

In the long run justice is done if the influence of each group is proportioned to its economic importance. A great injustice was perpetuated by the coal industry because the construction industry was not adequately organized to demonstrate its economic importance—was asleep at the switch in other words. Undoubtedly similar occasions will arise in the future which will call for a powerful national organization of the mineral aggregate industry.

To meet the present situation with the means at hand is not to sacrifice our principles of honest government; we look forward to the time when these various groups, struggling now primarily for their own selfish interests, will get together and consider if all their selfish interests do not have a good deal in common; and ultimately join hands for the common purpose of promoting all these interests in the same way. And it seems to us that the organization of powerful and truly representative groups of industries and their active promotion of selfish interests is but a step toward a better and more workable kind of representative democracy.

Government Ownership

If your township or county or state officials are agitating public ownership and operation of a sand and gravel, crushed stone or cement plant, ask your local newspaper men to help you educate these misguided public officials. A recent questionnaire on this very subject was sent out by the Press Service Co., New York City. Of the 220 newspaper editors who replied, 196 or 89 per cent were absolutely opposed to the government entering any industry in competition with legitimate producers.

Investigation of Customary Terms of Sale of Building Materials

Extracts from a Recent Report of Federal Reserve Board

WASHINGTON, D. C.—Terms of sale in the builders' supply trade have been made the subject of a special report which has just been issued by the Federal Reserve Board. The board is making a study of current practices and recent history of terms of sale in the principal industries. Following are extracts from its report:

A leading authority estimates that, roughly, about 60 per cent of building materials are sold by manufacturers to local dealers, while the remaining 40 per cent are distributed direct by the manufacturer. This is influenced largely by the location of plants. Practically all mason's materials are stated to be sold through the local dealer, in particular in the larger cities. When direct sales are made by the manufacturer, these occur generally in smaller outlying towns, but in some of the larger cities, e. g., Philadelphia and Chicago, some items, such as hard brick, are sold direct by the manufacturers, their plants being located in these cities. On the Pacific Coast, granite is almost universally quarried, cut and placed in the building by the same concern, without the intervention of jobbers and dealers, but in the East and Middle West it is frequently quarried for sale to jobbers and dealers. "Building specialties" manufactured in the East are first sold to coast jobbers, and by them to dealers or consumers. In the larger cities the great bulk of building material is sold by dealers to contractors rather than direct to consumers, but in small towns the trade is frequently divided, while in farm trade practically all sales are made direct to the consumer. In Atlanta it is estimated that possibly 75 per cent of contracts are on a "cost percentage" basis, the contractor placing the order to be billed direct to the owner. On the Pacific Coast it is stated to be "more expeditious to approach the owner of a prospective building with respect to supplying goods which must be ordered from the East, as the contractor frequently postpones ordering so long that delays intervene after the work has begun. In the West there is lacking that custom prevailing in the East under which contractors are themselves financially responsible for the work as it progresses."

Regular terms of building supply dealers are largely on a 30-day basis, the cash discount being 2 per cent 10th, or in some cases 15th, proximo, while net terms in certain cases are 60 days. In Atlanta, however, it is stated that all items other than cement, which carries a discount, are sold on net 30-day terms. A tendency to closer terms is reported by some firms, and decrease in the net period from 60-90 days, or longer, to 30 or in some cases 60 days. As stated by a leading New York firm, "ten years ago most of the speculative builders paid by notes entirely, and these notes were extended from time to time until final payment was made on the loan on the building. Due to advancing costs of the materials and also the handling of same, this method of payment was finally done away with. At the present time about 50 per cent of our customers discount within 10 days from date of invoice (proximo terms are employed), 35 per cent paying cash in 30 days, and 15 per cent paying by note in either 30 or 60 days, generally 30, and very rarely 60." The trade acceptance is little used by dealers, while where notes are taken, part cash, such as 50 per cent, may be required, and interest added. On the Pacific Coast "contracts for building materials customarily provide that the vendor shall receive 75 per cent of the value (figured on contract prices) of material delivered and installed during any month, on the 10th of the succeeding month, and the remaining 25 per cent within 30 days after completion of the contract (i. e., formal acceptance of the building)." Overdue payments bear interest at the legal rate, while where work is done for the state, payments each month are usually for 90 per cent of the value. As a result of laxness in that section with respect to the cash discount period, as well as the net period, there is stated to be a tendency to eliminate the cash discount. The tendency during the past decade has been rather toward stricter observance of existing terms, and the substitution of a net period of 30 days for one of 60 days, while the discount was reduced about three years ago from 5 per cent to 2 per cent.

Calder Committee in Chicago

ANNOUNCEMENT has been made that Senator Calder's committee on construction problems will hold sessions in Chicago, beginning November 10. Among the material men who have promised to testify are B. F. Affleck, president of the Universal Portland Cement Co.; C. A. Klotz, president of the Producers Material Co. (crushed stone), and J. W. Alder, president of the American Sand and Gravel Co.

Illinois Commission Fixes Maximum Rates for Sand

AS HAS BEEN NOTED in these columns, the Public Service Commission of the State of Illinois refused to grant the 40 per cent increase in freight rates allowed the railways in Illinois territory by the Interstate Commerce Commission. Instead, the Illinois commission granted a general increase of only 35 per cent for intrastate rates.

In addition to the fixing of the 35 per cent increase the commission also fixed the following maximum mileage scale for sand and gravel, according to the "Weekly Bulletin" of the Illinois Sand and Gravel Producers Association:

5	miles	and	under		the rate is	per ton	$0.55
10	"	"	over	5	" "	"	0.60
15	"	"	"	10	" "	"	0.65
20	"	"	"	15	" "	"	0.70
25	"	"	"	20	" "	"	0.75
30	"	"	"	25	" "	"	0.80
35	"	"	"	30	" "	"	0.85
40	"	"	"	35	" "	"	0.90
45	"	"	"	40	" "	"	0,95
50	"	"	"	45	" "	"	1.00
55	"	"	"	50	" "	"	1.10
60	"	"	"	55	" "	"	1.10
65	"	"	"	60	" "	"	1.20
70	"	"	"	65	" "	"	1.20
75	"	"	"	70	" "	"	1.30
80	"	"	"	75	" "	"	1.30
85	"	"	"	80	" "	"	1.40
90	"	"	"	85	" "	"	1.40
95	"	"	"	90	" "	"	1.50
100	"	"	"	95	" "	"	1.50
110	"	"	"	100	" "	"	1.60
120	"	"	"	110	" "	"	1.60
130	"	"	"	120	" "	"	1.70
140	"	"	"	130	" "	"	1.70
150	"	"	"	140	" "	"	1.80
160	"	"	"	150	" "	"	1.80
170	"	"	"	160	" "	"	1.90
180	"	"	"	170	" "	"	1.90
190	"	"	"	180	" "	"	2.00
200	"	"	"	190	" "	"	2.00
210	"	"	"	200	" "	"	2.10
220	"	"	"	210	" "	"	2.10
230	"	"	"	220	" "	"	2.20
240	"	"	"	230	" "	"	2.20
250	"	"	"	240	" "	"	2.30
260	"	"	"	250	" "	"	2.30
270	"	"	"	260	" "	"	2.40
280	"	"	"	270	" "	"	2.40
290	"	"	"	280	" "	"	2.50
300	"	"	"	290	" "	"	2.50
320	"	"	"	300	" "	"	2.60
340	"	"	"	320	" "	"	2.60
360	"	"	"	340	" "	"	2.70
380	"	"	"	360	" "	"	2.70
400	"	"	"	380	" "	"	2.80
420	"	"	"	400	" "	"	2.80
440	"	"	"	420	" "	"	2.90
460	"	"	"	440	" "	"	2.90
480	"	"	"	460	" "	"	3.00
500	"	"	"	480	" "	"	3.00

"When this matter was before the commission for public hearing, it was proposed that sand and gravel be classified as 10th class. It was suggested to the commission at that time that sand and gravel were not commodities of a nature that could properly be taken into the general classification and it is somewhat gratifying to note that the peculiar characteristics of the products have been recognized. It should be understood that the above rates are maxima, to be used only in the absence of a specific rate or when the published rate is higher."

Under the Supplemental Order, applying an advance of 35 per cent, specific rates on sand and gravel are increased as follows:

Prior to Aug. 26	Nov. 1	Prior to Aug. 26	Nov. 1
$0.50	$0.67½	$1.00	$1.35
0.55	0.74½	1.10	1.48½
0.60	0.81	1.20	1.62
0.70	0.94½	1.30	1.75½
0.80	1.08	1.40	1.89
0.90	1.21½	1.50	2.02½

General Market News

Texas Trying for Reduction of Freight Rates on Mineral Aggregates

BOTH SHIPPERS AND USERS of crushed stone, sand and gravel for highway purposes obtained a hearing recently before the Texas Railroad Commission to enter pleas for a 20 per cent reduction of the rates established by the Interstate Commerce Commission. The hearing resulted in the appointment by the commission of a joint committee of eight members to consider plans for accomplishing this reduction.

The decision to appoint this committee came after Judge H. M. Garwood, general attorney of the Southern Pacific lines, announced that in the event the commission should issue such an order the railroads feel it their duty to contest it. He added that while the railroads were inclined to aid in solving the problem, he insisted that the interstate commerce commission has jurisdiction over the stone, crushed stone, sand and gravel rates.

The committee which is to solve the problem is composed of four representatives from the petitioners and four railroad men, as follows: Rollen J. Window, State highway engineer; W. H. Darwin, Fort Worth, traffic bureau and West Texas chamber of commerce; Hugh L. Small, county judge of Tarrant county; H. C. Eargle, assistant traffic manager Houston Chamber of Commerce; Horace Booth, traffic manager, International and Great Northern railway; George Atkins, traffic manager, Missouri, Kansas and Texas Railroad, and T. J. B. Payne, traffic manager Texas and Pacific Railroad, and J. C. Mangham, general freight agent, San Antonio and Aransas Pass Railroad.

Judge Garwood declared that the interstate commission ordered the rates equalized and promulgated special rates which are protected by a court injunction, therefore only the interstate commission can change the rates.

The State commission contemplates holding a special hearing in about two weeks to hear the report of the committee.

Road building material rates were increased along with other freight rates and the recent advances authorized by the Interstate Commerce Commission went into effect on August 26, amounting to an increase of 35 per cent, but the former sliding scale reduced the amount so that approximately the 20 per cent rate remains in effect. The object then is to reduce the rates to what they were before the recent increases were made.

Bituminous Coal Production Reaching Record

THE WEEKLY PRODUCTION of bituminous coal in this country since October 1 has reached 12,000,000 tons and over. This record about equals that of periods in 1918 and 1919 when production was at a maximum.

Prices of coal at the mines in Illinois and other central west states are being forced down through fear on the part of the operators that other state authorities will follow the example of those in Indiana and fix the mine price.

A report from Washington, October 30, stated that the "coal famine" was so far relieved that orders restricting the use of open-top cars would shortly be modified to allow all open-top cars with sides of 40-in. height or less to be used for mineral aggregates.

Rock Products Men Preparing for Home-Building Exhibits

THE NATIONAL LIME ASSOCIATION and the Portland Cement Association have already arranged to have exhibits at the "Own Your Home Expositions" at Chicago, March 26 to April 2, and at New York, April 16 to April 30. The Gypsum Industries Association will probably exhibit also. This will be the third exposition in New York but the first in Chicago.

The housing situation in all the large cities, having become acute and the solution of the problem becoming imperative, it is thought that this exposition will do much to relieve the situation by arousing more interest among people who can build. To this end the backers of this great affair will make it practical and will offer definite plans whereby men of small means may have the satisfaction of owning their homes and thus becoming more stable citizens. In other words, it is an Americanization plan of the most practical kind.

It is the idea to inaugurate a prize competition among architects for artistic and economical plans for small houses, as one of the eminently practical features of the show. The winners of these prizes will have their designs published in book form which will be available at the Expositions.

It is planned to have the exposition complete in every detail from the finished model of the prize houses, with grounds laid out, down to the smallest detail of furniture and interior decorating. Every branch of the building industry will be represented, and all affiliated branches will also have representation. The Lee Lash Studios are now at work on an elaborate scenic background which will visualize the "Own Your Home" spirit. Robert H. Sexton, Managing Director, has as his associates some of the most prominent and influential men in Chicago and New York.

The chairman of building materials section Charles P. Thompson, president of the Chicago Building Materials Exchange. A. J. R. Curtis, secretary of the National Conference on Concrete House Construction, represents the cement interests.

No Duty on Canadian Limestone

PROTESTS OF THE LACKAWANNA STEEL CO. and William A. Bird, of Buffalo, N. Y., against the U. S. Customs Collector's assessment of duty upon certain crushed stone at 20 per cent ad valorem under paragraph 81 of the Tariff Act are sustained in a decision handed down recently by the Board of United States General Appraisers. The contention of the protestants for free entry as limestone, unmanufactured, under paragraph 614, is upheld.

Famous Scientist Says Rock Phosphate Has Been Undervalued

J. HENDRICK, in the September, 1919, issue of the Journal of the Society of Chemical Industries, discusses the phosphate industry throughout the world, with special reference to the United States and Great Britain, and reports the average results of 66 field experiments with turnips covering four years at the North of Scotland Agricultural College comparing soluble and insoluble phosphates.

"The general result of the experiments is to show (1) that the average effect of superphosphate is only slightly greater than that of insoluble phosphate, such as basic slag or ground mineral phosphate, when equal weights of phosphoric acid are applied, and (2) that if one-third of the phosphoric acid is given as soluble phosphate and the remainder as insoluble phosphate the average result is as good as when the whole of the phosphoric acid is given as soluble phosphate. Experiments with other crops, and especially with grass, give a similar result. The only conclusion one can come to is that soluble phosphate is over-valued, and insoluble phosphate, such as exists in basic slag and ground mineral phosphate, undervalued. It should be possible in future to use a large part of the rock phosphate in the form of finely ground powder instead of in superphosphate. This will effect a great saving in acid and in expense."

Accident Prevention

Safe Use of Hoisting Apparatus

(Prepared for Rock Products by the Engineering Department of the National Safety Council.)

THIS is Part 2 of an article begun in the October 23 issue of ROCK PRODUCTS.

Annealing

There is considerable difference of opinion about the so-called "crystallization" of chains and methods of avoiding or removing it. Many authorities, while recognizing that some structural change does take place in metal under frequent or constant stress, are not satisfied that annealing should be depended upon to restore the chains to their original strength.

It is certainly not safe to anneal chains in a blacksmith forge or in an open bonfire, where the heat of the metal must be judged by its color only, as the chance for a bad guess is too great. Wherever annealing is attempted, it should be done only in properly equipped annealing furnaces and under the direct supervision of a competent person thoroughly versed in heat treating.

Marking Hoisting Equipment

All hoists should be plainly marked with their capacity. A good plan is to paint all hook blocks white, and to paint on this white background (in red letters) the capacity of the hoist. This has the advantage of making every hoist block easily discernible.

Electric Hoists

It is important that a reliable limit stop be provided to prevent the hoist from traveling too far in case the operating handle is not released in time.

Many accidents have resulted because an operator mistook the lowering handle for the hoisting handle or vice versa. It is suggested that the handles of control ropes be distinctly different in contour so that, even without looking, the operator will know which is the hoisting and which the lowering handle. This will enable him to watch the work closely while operating the hoist.

A spreader through which the control ropes pass and which will keep them separate is also advisable. Each also should be clearly marked "Hoist" or "Lower"; some companies attach to each control rope an arrow pointing in the direction the load will move in case that rope is pulled.

No attempt should ever be made with a monorail hoist to lift or move a heavy object by a side pull. Such a practice is not only liable to spread or break the trolley frame but is also apt to loosen the I-beam supports.

One of the greatest hazards in the operation of overhead monorail systems, whether operated by a chain hoist, electric hoist, or from cage, is introduced by the necessity for having turnouts or switches, and turntables. Trolleys frequently run off the ends of I-beams (tracks) when a switch has been left in the open position, and often with serious results. It is very important therefore that a stop be provided at all switches and turntables which will prevent the trolley from running off should the switch be turned or be left in the open position.

One member of the National Safety Council has installed electric signal lights (green and red) at all switches and turntables, on an electrically operated monorail system. These lights automatically change as the switch is operated and indicate to the cranemen whether the track is in the open or closed position.

Some serious accidents have resulted when monorail cranes have fallen due to failure of suspension pins by which the load is supported from the trolley frame. It is advisable that every monorail hoist be equipped with one or more safety catches which will support the load should a suspension pin fail or the trolley frame spread.

Air Hoists

Hoists consisting of air cylinders mounted on hangers or trolley carriages and operated by air pressure are in general use in many crushed-stone plants. The hazards in their use are about the same as with the electric or chain hoists. The operating handles should be of different contour, so that workmen will be able to tell which handle to pull for hoisting or lowering without actually having to look at handles.

The lock nut which holds the piston on the piston rod should be secured to the rod by a castellated nut and cotterpin.

The method of attaching air hoist cylinders to trolleys or support is also of importance. A clevis should be used, or other means taken to prevent hoist becoming detached from the hanger.

Jib-Cranes

A substantial stop should be provided at the end of the arm of a jib-crane to prevent the trolley from running off the end of jib.

Side pulls should not be made with a jib-crane. The jib arm should be directly over the load when making a lift.

The gears of all cranes should be enclosed, and if hand-operated by means of a crab or winch it is very important that a locking dog be provided to hold the load when the handle is released.

Portable Floor Cranes

Portable floor cranes are very useful in many plants where the overhead construction, belting, shafting, etc., prevent the use of hoists or overhead cranes, and where infrequent service does not justify more expensive equipment. These cranes are very handy for placing work on machines, for loading heavy material on trucks, and also for transporting material from one location in the shop to another.

Crabs and Winches

The greatest danger to the operator in the use of crabs and winches is that of being struck by the revolving handle. It is important that some form of brake or safety lowering device be provided on all crabs and winches. For rapid lowering of the load, a strap brake is perhaps more practical.

(To be continued)

The First Run of the 1921 Safety Calendar Is Ready for Distribution

Size 10⅞x18 in.

EACH MONTH of the calendar is printed on a separate sheet, with a clever, high-grade, three-color illustration at the top of each. Twelve humorous pictures, each driving home forcibly its own safety message.

HAZARDS common both to the home and the factory—serious because of the frequency of the accidents which they cause—are the subjects around which these illustrations are built.

THIS CALENDAR offers a splendid opportunity to round out safety instructions given to the man in the shop by carrying the message into his home, to his wife, and to his children, and through them, back to him.

National Safety Council

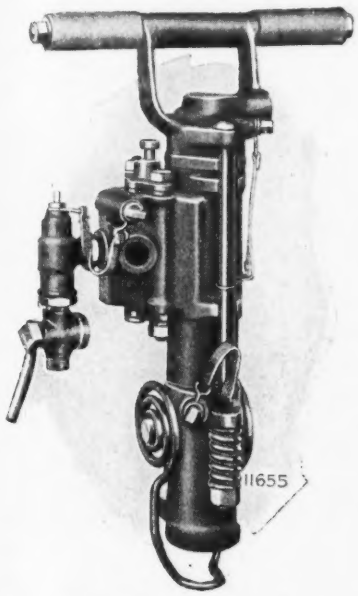
Co-operative—Non-Commercial

168 North Michigan Avenue, Chicago, Ill.

New Machinery and Equipment

Another New "Jackhamer"

ANOTHER "Jackhamer" has just been brought out by the Ingersoll-Rand Co., 11 Broadway, New York. It is known as the "DCR-13." This completes the "family of Jackhamers" manufactured by this company. The others are: the "BAR-33," 21 lb.; the "BBR-13," 36 lbs.; the "BCR-430," 41 lb., and the "DDR-13," 70 lb.; altogether there are five sizes and 13 types. This company now claims to have a "Jackhamer" available for every hand hammer rock drilling job.



"D C R-13" Jackhamer

The new "Jackhamer" weighs 55 lb. It is rated to drill holes up to 12 ft. deep rapidly in hard rock and it is claimed it will fill all the requirements of a medium weight "sinker" or down hole drill.

The features most worthy of note are:

All steel construction—Steel drop forgings or bar stock being used exclusively and specially heat treated.

All bolted construction—Nothing to work loose and easy of access. Automatic rotation—Very powerful, relieving the operator of this fatiguing part of the work. Spring retained front-head—Takes up shocks that would otherwise fall on the machine. "Spool Butterfly" valve—Operating on the well known "Butterfly" principle. "Handy" hole blowing device—Very effective in keeping the drill hole clear. Renewable bushing in rotation sleeve. Automatic "Heartbeat" oiler and grease pockets in handle and fronthead assure continuous satisfactory lubrication.

A New High Speed Ball Bearing Screw Jack for Heavy Lifting

SEVERAL NOVEL FEATURES of construction are embodied in the latest design of a high-speed, ball-bearing screw jack, a tool which is particularly adapted for bridge work and other purposes where a lifting capacity of 50 and 75 tons is required.

The most noticeable thing is the fact that the operating mechanism, instead of being located in the head, is placed in the base. The greater weight is thus put at the bottom instead of at the top, so that the jack is not top-heavy. Another advantage is that the point at which the operating lever is pivoted does not rise with the load. This allows a full, powerful stroke, regardless of the height of the load.

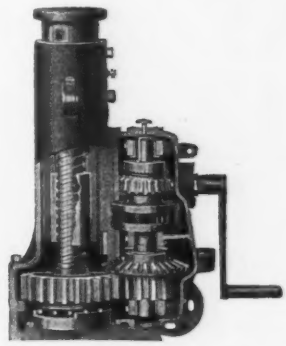
Lowering the jack

This newly designed jack is unusually easy to move about. Not only does the concentration of weight in the base make it easy to handle, but by inserting the operating lever in special sockets, the jack can be tipped over by one man and rolled on its own sturdy wheels wherever needed.

The load is raised by means of a 6-ft. steel lever which operates a double-thread screw through a ratchet and gearing. The screw has a very steep pitch, making the action extremely rapid. The screw is made of special machinery steel, heat treated, and turns in a bronze nut of special composition. This combination of bronze and hard steel materially reduces friction.

Absolute safety is stated to be assured by a positive clutch which holds the load at all times, preventing any possibility of it sinking or lowering. Another safety feature is the signal which is provided to indicate when the jack has reached its maximum height.

For lowering, a crank handle is used.



Cross section of jack

A few easy turns are all that are required as the action is very rapid. Regardless of the speed with which the load may be descending, it is claimed that it may be stopped with absolute safety at any point desired. The action is positive, so there is no possibility of sticking, as there is in the case of jacks that depend upon the load to run them down. A crank handle may also be used for rapidly raising the jack up to the load.

The operating mechanism, instead of being located in the head of the jack, as is the case with all other screw jacks of this type, is placed in the base. The greater weight is thus put at the bottom instead of at the top, so that the jack is not top-heavy. Another advantage is that the point at which the operating lever is pivoted does not rise with the load. This allows a full, powerful stroke, regardless of the height of the load.

This new high-speed ball-bearing screw jack, built by the Duff Manufacturing Co., of Pittsburgh, is made in two capacities, 50 and 75 tons maximum. Both the 50 and the 75-ton jack are supplied in a variety of heights to suit requirements.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:			1.40 per net ton, all sizes			
Buffalo, N. Y.	1.00	.....	2.50	2.00	2.00	.....
Burlington, Vt.	1.80	2.25	2.00	1.80	1.80	.....
Califon, N. J.	1.75	1.75	1.75	1.50	1.50	1.50
Chaumont, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.25§
Coldwater, N. Y.	1.45	2.50	2.40	2.00	1.60	1.45
Grove, Md.	1.25	1.25	1.25	1.25	1.25	1.25
North Leroy and Akron, N. Y.	1.35	1.35	1.85	1.85	1.85	1.85
Redington, Pa. (dolomite)	1.00		All other sizes 1.50			
Utica, N. Y.	2.00	2.25	2.00	1.80	1.60	.....
Vernoy, N. J.						
CENTRAL						
Alden, Ia.	1.00	.....	1.50	1.45	1.45	.....
Alton, Ill.	2.50	.....	2.00	2.00	1.75	.....
Bettendorf, Ia.			All sizes, 1.75 cu. yd.			
Buffalo, Ia.	.....	1.35	1.45	1.25	1.25	1.35
Chicago, Ill.	1.58	1.90	1.70	1.58	1.58	1.58
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1,90
Coralville, Ia.	1.25	1.60	1.55	1.50	1.40	.....
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Dundas, Ont.	.75	1.50	1.50	1.35	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.25@1.50	1.35	1.25	1.10@1.20	1.10	1.10
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinois, Southern	2.00@2.25	1.75	1.75	1.75@1.85	1.75@1.85	1.85
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Kokomo, Ind.	1.10	1.10	1.25	1.20	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.70	1.60	1.50	1.50	1.50	1.50
Linwood, Ia.	1.00	.....	1.45	1.25	1.25	.....
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.95@1.00	.....	1.20	1.20	1.20	1.20
Montrose, Ia.	1.25	1.75	1.75	1.65	1.65	1.65
Oshkosh, Wis.			1.40 per ton, all sizes			
Ottawa, Can.	3.00	3.25	3.40	2.75	2.50	.....
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.25	1.25
Silica, O.	1.00	1.50	1.30	1.20	1.00	1.00
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Stone City, Ia.	.80	.....	1.60	1.50	1.40	.....
Toledo, Ohio, f. o. b. cars	1.85	2.10	2.10	2.10	1.85	1,85
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
Winnipeg, Can.	2.90*	.....	3.25*	2.90*	.....	.....
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	2.50	2.50	2.50	2.50	2.50	2.50
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50	.....	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Fort Springs, W. Va.	1.85	2.00	2.00	1.85	1.65	1.50
Garnett, Okla.	.65	.....	1.75	1.75	1.60	.....
Mascot, Tenn.	.....	1.50	2.00	.....	1.50@2.00	.....
New Braunfels, Tex.	.60	1.75	1.75	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	.....	2.10	2.10	2.10	.....
Blue Springs and Wymore, Neb.	.20	1.95	1.95	1.85@1.90	1.75@1.80	1.70
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50
Terminous, Calif.	.....	1.25	.....	.....	.....	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.75	1.65	1.45	1.25	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Bound Brook, N. J.	2.10	2.30	2.00	1.85	1.70	.....
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.50	2.00	1.50	1.50	1.50
E. Summit, N. J.	2.10	2.35	2.15	1.85	1.80	.....
Glen Mills and Rock Hill, Pa.	1.60	1.90	1.90	2.25	2.10	1.90||
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
San Diego, Calif.	.....	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40	.....
Winchester, Mass.	.85	.85	.85	2.10	1.85	1.60

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Hendlers, Pa.—Quartzite	.90	.90	1.20	1.45	1.35	1.10
Little Falls, N. Y.—Syenite	.90	1.30	1.30	1.50	1.40	1.30
Middlebrook, Mo.—Granite	4.00	.....	2.00	2.00	.....	1.50‡
Ottawa, Can.—Granite	5.50	5.00	5.50	5.00	.....	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	1.20	1.70	1.70	2.00	1.85	1.70

*Cubic yard. †Agrl. lime. ||R. R. ballast. ‡Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$ — 70% thru 200-mesh, 95% thru 40-mesh; bags, $5.00; bulk 3.25

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); sacks, 4.50; bulk 2.75

Gasport, N. Y.—90% thru 50 mesh, bulk, 2.50; bags 4.25

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 5.50; bulk 4.50

Grove, Md. — (50% thru 50 mesh); paper bags, 6.75; bulk 5.00

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (70% thru 100 mesh); sacks, 5.00; bulk 3.25

Jamesville, N. Y.—Analysis, $CaCo_3$, 89.25%; $MgCo_3$, 5.25%; bulk, 2.75; sacks 4.50

Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk 2.75

Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk 2.75

West Stockbridge, Mass. — Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk 2.85

Williamsport, Pa. — Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk ..... 4.00@5.50

CENTRAL:

Alden, Ia.—Analysis, $CaCo_3$, 99.16% ..... .80

Alton, Ill. — Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—90% thru 100 mesh 9.00

Bedford, Ind. — (90% thru 10 mesh) Analysis, $CaCo_3$, equivalent 98.5% 2.00

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk 2,50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh 1.50

Columbia, Ill., near East St. Louis (½-in. down) ..... 1.25@1.80

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh 1.25

Greencastle, Ind.—(Analysis $CaCo_3$, 98%), 50% thru 50 mesh 2.00

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 5.25; bulk 3.00

Mayville, Wis. — $CaCo_3$, 53.65%; $MgCo_3$, 43.72% ..... 1.75@2.00

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼-in. sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 34.86% thru No. 50; 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, $CaCo_3$, 93.10%; $MgCo_3$, 3.20%—(70.8% thru 20 mesh) 1.65

Montrose, Ia.—(90% thru 100 mesh) 1.25

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—

50% thru 100 mesh ..... 3.50@5.50

50% thru 50 mesh ..... 2.00@4.00

50% thru 4 mesh ..... 1.75@2.00

Ridgeville, Ind.—(Analysis $CaCo_3$, 98%), 100% thru 4 mesh 1,75

River Rouge, Mich.—Analysis: $CaCo_3$, 54%; $MgCo_3$, 40%; bulk ..... .80@1.40

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ½-in. mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% 2.25

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12% 1.50

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) ..... .80

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80

Whitehill, Ill. — Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—

50% thru 100 mesh 5.00

50% thru 50 mesh 5.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96% combined carbonates—90% thru 100 mesh 3.00
Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50
Dittlinger, Tex. — Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%—
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00
Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 3.00
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh 3.00
Linnville Falls, N. C. — Analysis, $CaCo_3$, 53%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.50; bulk 3.00
Marion, Va. — Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.50
Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00
Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 3.00
(All thru 10 mesh) 2.50
(80% thru 200 mesh) 5.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.
Maxwell, Va. 2.50
Mountville, Va.—Analysis, $CaCo_3$, 75.6%; $MgCo_3$, 22.83%—50% thru 100 mesh; 100 lb. ppr., 7.00; bulk 5.00
Ocala, Fla. — Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50
Tyrone, Ky.—Analysis, $CaCo_3$, 90%; $MgCo_3$, 4%—90% thru 4 mesh ..... 1.75@2.25

WESTERN:

Cement, Calif.—Analysis, $CaCo_3$, 95%; $MgCo_3$, 2%—(50% thru 50 mesh) 5.00
Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½% (all to pass 14 mesh)—bulk, 3.50; bags 4.50
Sacks, 15c extra, returnable.
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 2.00
Oro Grande, Calif.—Analysis: $CaCo_3$, 94%; $MgCo_3$, 2%; 85% thru 200 mesh; $4.00, bulk; bags 10.25
Terminus, Calif. — Analysis, 96.4% $CaCo_3$, 1.3% $MgCo_3$—(60% thru 200 mesh; 80% thru 100 mesh; 100% thru 50 mesh); sacks, 6.00; bulk 5.25
Tulsa, Okla.—90% thru 4 mesh ..... .65

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 3.00@3.50
Bridgeton, N. J.—Washed, 2.50; dried 3.00
Cedarville and South Vineland, N. J.—Damp, 2.00; dry 2.50
Columbus, Ohio ..... 2.50@3.00
Gray Summit, Mo. ..... 2.50@4.00
Guion, Ark.—Carlots 2.50
Hancock, Md.—Damp 2.00
Klondike and Pacific, Mo. ..... 2.50@4.00
Mapleton, Pa.—Dry 4.00
Glass, damp 3.00
Massillon, Ohio 3.50
Millington, Ill. ..... 2.25@3.00
Mineral Ridge, Ohio 4.00
Montoursville, Pa.—Green, washed ..... 2.00@2.75
Morgantown, W. Va. ..... 3.00@3.25
Oregon, Ill.—Large contracts ..... 2.00@2.50
Ottawa, Ill. 2.50
Pittsburgh, Pa.—Dry, 4.00; damp 3.00
Robinson, Md.—Washed, damp 2.00
Rockwood, Mich. ..... 3.00@4.00
Round Top, Md.—Glass and damp, $2.50; core 2.25
St. Marys, Pa.—Green 3.00
Sands, Elk Co., Pa.—Selected, green 2.75
Thayers, W. Va.—Washed 3.00
Tygarty, Ky.—Washed, not dried 2.60
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Albany, N. Y.—
Molding, fine and coarse 2.25
Brass molding 2.50
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse 1.50
Arenzville, Ill.—Molding fine ..... 1.80@2.25
Beach City, Ohio—Core ..... 3.00@3.50
Furnace lining ..... 3.50@4.00
Molding fine and coarse ..... 3.00@3.50
Sand blast ..... 3.50@4.00
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse 1.70

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		**1.30**		**1.30**	**1.00**	**1.00**
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Erie, Pa.		1.00	1.15		1.25	
Farmingdale, N. J.	.48	.48	1.70	1.70	1.40	1.40
Hartford, Conn.	**.90**		**1.25**	**1.15**	**1.15**	**1.15**
Leeds Junction, Me.		.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	**.75***	**.75***	**1.70**		**1.50***	**1.50***
Washington, D. C.	**.75**	**.75**	**2.00**	**1.40**	**1.20**	**1.20**
York, Pa.		1.20@1.30	(crushed gravel)			
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Attica and Covington, Ind.	1.00	1.00	1.00	1.25	1.25	1.25
Barton, Wis.	.70	.70		.80		.80
Chicago, Ill.		1.75@2.33	1.75@2.33			
Cincinnati, O., and vicinity	1.20	1.15	1.15	1.15	1.15	2.00
Columbus, O.		.70@1.25	1.00@1.25	.80@1.25	.80@1.25	.70@1.25
Des Moines, Ia.	1.00	.75	1.65	1.65	1.65	1.65
Detroit, Mich.		.70		.85 (64/40)		.95
Earlestead (Flint), Mich.	**.60**	**.70**		**1.05**	**.95**	**.95**
Eau Claire, Wis.	**.60**	**.60**	**1.35**		**1.10**	
Elkhart Lake, Wis.	**.75**	**.60**	**1.00**	**.84**	**.84**	**.84**
Grand Rapids, Mich.		.60		.90	.85	.85
Greenville, Mechanicsburg, O.	**.80**	**.70**	**.80**	**1.00**	**.85**	**.80**
Humboldt, Ia.	**1.00**	**.85**	**1.90**	**1.90**	**1.90**	**1.90**
Indianapolis, Ind.	**.60**	**.60**		**1.50**	**.75**	**.75**
Janesville, Wis.		.80			.90	
Lincoln, Neb.	Sand .80, sand and gravel 1.30, drained for shipment					
Mason City, Ia.	**1.00**	**.90**	**2.00**	**1.85**	**1.85**	**1.75**
Milwaukee, Wis.	1.55	1.55	1.60	1.60	1.60	1.60
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.50
Pittsburgh, Pa.		1.30	1.30		1.00	1.00
Riton, Wis.		.85				.85@1.00
Saginaw, Mich., f. o. b. cars	**1.30**	**1.30**	**2.20**	**1.95**	**1.85**	**1.85**
St. Louis, Mo., f. o. b. cars	1.65	1.70	1.85	1.65	1.60	1.60
Summit Grove, Clinton, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Terre Haute, Ind.	1.00	1.00	1.25	1.00	1.25	1.25
Toledo, Ohio	**.75**	**.75**				
Winnipeg, Can.	2.00			2.35	2.00	2.00
Yorkville, Moronts, Oregon and Sheridan, Ill.	.90@1.00	.90@1.00	.90@1.00	.90@1.00	.90@1.00	.90@1.00
SOUTHERN:						
Flomaton, Ala.		**.85@1.00**				**2.00@2.50**
Ft. Worth, Tex.	2.00@2.25*	2.00@2.25*	2.75@3.00*	2.75@3.00*	2.75@3.00*	
Knoxville, Tenn.	**1.25**	**1.25**	**1.65**	**1.65**	**1.65**	**1.50**
Lake Weir, Fla.		**.75**				
Macon, Ga.		.75@1.00				
Memphis, Tenn.	**1.40**	**1.40**	**1.50**			**1.50**
N. Martinsville, W. Va.		**1.40**				**1.20**
New Orleans, La.	1.00		1.75			
Pelzer, S. C.	**.90**					
Pine Bluff, Ark.	1.25	.95	Washed gravel, all sizes, 2.40			
Tulsa, Okla.		**.70**				
Waco, Texas	**.70@ .80**	**.70@ .80**				**1.10**
WESTERN:						
Grand Rapids, Wyo.	**.50**	**.50**	**.85**	**.85**	**.80**	**.80**
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Niles, Calif.	**1.00**	**1.00**	**.90@1.10**	**.85@1.00**	**.85@1.00**	**.85@1.00**
Pueblo, Colo.	.95	.90				2.00
San Francisco, Calif.		**1.00**	**1.00@1.20**	**.85@1.00**	**.85@1.00**	**.85@1.00**
Saratoga, San Jose, Calif.		**.60@ .75**	**.60@ .70**	**.60@ .70**	**.60@ .70**	**.60@ .70**
Vancouver, B. C.		**1.30***		**1.30***		**1.20***
Porteau, B. C.	1.30	1.30	1.30			1.20

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Fishers, N. Y.	**.85@1.00**				**1.00**	
Glenville, N. Y.				**1.00***		
Hartford, Conn.		1.00*				
Yardville, N. J.		**.50@ .75**				
York, Pa.		1.00@1.30		(crushed rock sand)		
CENTRAL:						
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.85	.85	.85	.85	.85	.85
Cherokee, Hawarden, Ia.		.80 per ton—1.20 washed				
Des Moines, Ia.	Washed con. mix., 25% gravel, 1.00; 50% gravel, 1.20					
Earlestead, (near Flint, Mich.)	.60 per yd.					
Elkhart Lake, Wis.	.90 per ton (washed concrete material)					
Ft. Jefferson, Mechanicsb'g, O.	**.70**	**.60**	**.60**			
Greenbush, Mich.	**.65**					
Hersey, Mich.	.60			.60	.60	
Janesville, Wis.		.65			.75	
Lincoln, Neb.	Sand gravel mix, 1.30					
Oxford, Mich.						.85@ .95
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo., f. o. b. cars						1.75
Summit Grove, Ind.	**.65**	**.65**	**.65**	**.65**	**.65**	**.65**
Toledo, Ohio					.75	
Yorkville, Oregon, Moronts and Sheridan, Ill.						.80@ .90
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)		1.15		1.10		
Lindsay, Tex.	1.50				.50	
Valde Rouge, La.						.60@ .75
Waco, Texas						.95
WESTERN:						
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25	1.25	2.00	1.25		1.25
Yorkville, Ore.		.40			.40	

* Cubic yard. B Bank L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Buffalo, N. Y.	2.35	1.30	1.30	1.30	1.30	1.30	1.30
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	.90	1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Hokendaugua and Donaghmore, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and Struthers, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, Jackson, O.	2.00	1.35	1.35	1.35	1.35	1.35	1.35
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard and Leetonia, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Longdale, Goshen, Glen Wilton and Low Moor, Va.	2.50	1.00		1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Bellefonte, Pa.	10.50		95.5	.72	11.50
Berkeley, R. I.			50	18	15.00
Branchton, Pa.		5.50			
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	10.50		45.50	30.50	13.00
Chippewa, Pa.	6.50@7.00		78.67	1.33	
Farnams, Mass.	6.50	8.00	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove, Md.	8.00				10.75
Highgate Springs, Vt.	6.00		85	2	8.00
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Kiln, Md.	9.50	13.50			13.50
Lime Ridge, Pa.	5.25@6.50		80.56-62.56	3.87-1.75	
Mt. Union, Pa.	6.25		93.69		
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Paxtang and Lemoyne, Pa.	4.00@6.00		60	12	
Rosendale, N. Y.	8.00	9.00	92	5	
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.25	12.00	84-87	2-3	12.00
West Rutland, Vt.	5.50	8.00	68	3	
West Stockbridge, Mass.	3.35	5.35			12.00
York, Pa.	10.50		70	3	13.00
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	12	13.50
Knowles and Valders, Wis.	4.00	9.00	55	45	13.00
Manistique, Mich.	11.00		95	2	11.00
Marblehead, O.					13.00
Mitchell, Ind.					13.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Woodville, Ohio	7.00	9.00	48	36	13.00
SOUTHERN:					
Blowers, Fla.	5.50		98.5		
Burns, Tenn.	10.00		96	0.54	14.00
Chippewa, Fla.	5.00		80.0	15.0	
Claremont, Va.	5.00	7.00	85-95	2-5	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Erin, Tenn.	11.00		97.82	0.12	
Knoxville, Tenn.	12.00		98.5	.05	15.00
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	6.50		84		6.50
Newala, Ala.	8.10		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½	(dry basis)	
Staunton, Va.	9.00	11.50	80.00	15.00	
WESTERN:					
Colton, Calif.	15.00		97	2	
Kirtland, N. Mex.	12.00				
San Francisco, Calif.		15.00	97	0.33	15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands

(Continued from preceding page)

Bridgeton, N. J.—Core	2.00
Cleveland, O.—Molding coarse	2.00@2.50
Brass molding	2.00@2.50
Molding fine	2.00@2.50
Core	1.25@1.50
Columbus, O.—Core	1.00@3.00
Brass molding	3.50@4.00
Glass sand	3.00
Molding fine and coarse	3.00
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding, coarse	1.90
Brass Molding	2.15
Eau Claire, Wis.—Core	.60@ .70
Sand blast, wet	1.75@2.25
Sand blast, dry	3.00@3.50
Traction	.60@ .70
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.25
Brass molding	2.50
Core	3.00
Molding fine	3.00
Molding coarse	3.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	2.00@2.25
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00@2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.80
Klondike and Gray Summit, Mo.—Molding fine	2.00@3.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	2.50
Core, furnace lining, moulding, fine and coarse, dry	3.00
Massillon, O.—Molding fine	4.00
Core and molding, coarse	3.50
Glass sand	4.00
Traction	3.50
Furnace lining	4.00
Michigan City, Ind.—Core, bank	.75
Millington, Ill.—Glass and core	2.25
Core sand	2.25
Furnace lining	2.50
Roofing sand	2.25
Stone sawing	2.25
Mineral Ridge, O.—Core, molding sand blast, roofing, etc., washed screened (damp)	3.25
Montoursville, Pa.—Core and traction	1.50@2.00
Brass molding	1.75@2.25
Glass sand	2.00@2.75
New Lexington, O.—Molding fine	4.25
Molding coarse	3.75
Oregon, Ill.—Core, furnace lining molding fine and coarse	2.25@2.75
Sand blast	3.50@4.00
Ottawa, Ill.—Crude silica sand	1.50@1.75
Ottawa, Ill.—Core, furnace lining molding, fine and coarse	2.50
Sand blast	4.00
Glass sand	2.50
Roofing sand	2.25
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
St. Peter, Minn.—Glass sand	2.25
Core sand	2.25
Brass molding	2.25
Molding fine	2.25
Rockwood, Mich.—Glass sand, core, roofing, stone sawing	3.50@4.00
Sand blast	3.50@4.00
Thayer, Pa.—Traction	2.25
Furnace lining	1.40
Molding fine and coarse	1.25@1.50
Core, steel	2.50@3.00
Tygarty, Ky.—Core and stone sawing	2.60
Fire-brick sand, washed but not dried	2.15@2.40
Utica, Pa.—Core	3.00
Molding fine	3.00
Molding coarse, traction	3.00
Brass molding	3.00
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	3.00
Same, green	2.50
Wedron, Ill.—Core (crude silica)	1.25
Molding fine, coarse	1.25
Furnace lining	1.50
West Albany, N. Y.—Molding fine	2.50
Molding coarse	2.50
Brass molding	2.50
Zanesville, Ohio—Molding fine and brass	2.50@3.00
Molding coarse	2.25@2.50

Crushed Gypsum

Castalia, O.—Crushed, to cement mills	4.00
Ft. Dodge, Ia.—Bulk	4.00
Grand Rapids, Mich.—Crushed gypsum rock	4.50
Gypsumville, Man., Can.—Crushed	3.50
Oakfield, N. Y.	4.00
Gypsum, O., and Akron, N. Y.	4.50@5.50

(Gypsum) Land Plaster

Castalia, O.—Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00.	
Garhutt, N. Y.—Land plaster, bags	8.00
Grand Rapids, Mich.—Ground gypsum rock	8.50
Mound House, Nev.—Ground gypsum rock	7.50@8.00
Sacks, .25 extra	
Oakfield, N. Y.—Ground Gypsum rock	8.00
Plasterco, Tex.	12.00
Sandusky, O.	6.00
Jute, 3.00 extra; ppr., 1.00 extra.	
Los Angeles, Calif.	12.40@14.40

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centerville, Tenn.—B. P. L., 65%	8.25
B. P. L., 70%	9.00@10.00
Brown rock, 75% and better	12.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00@9.50
B. P. L., 70%	9.50
B. P. L., 72%	9.50
B. P. L., 75%	12.00
Lump rock, long ton, 70%	9.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13% phosphorus	7.50@9.00
14% phosphorus	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	11.50
Norwills, Fla.—Fla. Hard Rock (B. P. L., 68%)	10.00
Wales, Tenn.—(B. P. L., 70%)	8.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags)	15.00

General Market News

Railway Men Promise Wisconsin Producers Better Service in 1921

REPRESENTATIVES of the traffic departments of the Chicago, Milwaukee and St. Paul Ry. and the Chicago and Northwestern Ry. were the invited guests at the regular monthly meeting of the Wisconsin Mineral Aggregate Association at the Milwaukee Athletic Club, October 26. Most of the meeting was devoted to questioning them on the prospects of adequate transportation service next season.

The railway men said that both these railways were making big investments in new open-top cars and that they fully expected to take care of all the mineral aggregate traffic offered next season, although of course they could not make any guarantees.

The occasion was also taken advantage of to tell the railway men what rotten condition for loading their cars were in, when delivered to the producers' plants. Figures were quoted to show the sums mineral aggregate shippers are obliged to spend to make the cars capable of carrying their materials.

Altogether the meeting was a most satisfactory one for the producers, because at least they had an opportunity of telling their troubles first hand to responsible railway officers. Apparently the railway men also appreciated the opportunity to meet some of their shippers face to face, and there is every reason to believe the two parties have been permanently benefited by the meeting.

Cement Manufacturers Prepare for Big Demands

REPORTS FROM CEMENT PRODUCING centers from coast to coast show preparations are being made to meet an enormous demand. Stocks of cement are nearly everywhere low, but practically all the leading mills spent large sums this year on improvements designed to increase storage facilities of both finished cement and clinker, as well as raw materials.

The cement industry in the Lehigh region of Pennsylvania is operating under better conditions than those existing for a number of years. The mills are receiving a full supply of cars and adequate supplies of fuel. The labor situation is greatly improved. A number of the mills have been put upon a day and night shift basis and a very heavy tonnage of cement is being manufactured to meet an excellent demand.

From Washington State comes the report that anticipating a good demand for cement next year the big plant of the Olympic Portland Cement Co. at Bellingham will run all winter, giving steady employment to about 100 men at the plant and to between 40 and 50 at its quarries at Balfour. The factory will run at full blast, producing 2,000 barrels a day. Much of this will be stored for the business expected to open up next spring.

Similar reports are received from other centers. In Texas the present shortage of cement is causing considerable agitation for a state-owned, convict-operated plant, which, of course, will be opposed by all citizens who are familiar with government ownership experience. It is said a bill will be introduced in the Minnesota State Legislature this winter for a state-owned cement plant.

The Use of Limestone Has Revolutionized Southern Illinois Agriculture

WHEN A SPECIAL TRAIN OF 50 cars of agricultural limestone arrived recently from quarry plants at Olney, Ill., the farmers knocked off work, had a parade with a brass band and had a general celebration. There was a reason. In the Chicago "Tribune" of Sunday, October 24, 1920, Frank Ridgway describes what the use of agricultural limestone has done for the southern end of the State of Illinois, the section opposite St. Louis and known as "Egypt."

Legumes Factors in Improvement

The use of the limestone, rock phosphate, sweet clover, and other legumes are revolutionizing agriculture in the southern counties. The introduction of soybeans, sunflowers, and other crops has enabled farmers to disregard the chinch bug, corn ear worm, and other serious farm pests in that section. But probably no single factor has had so much to do with improving that part of the state as the application of limestone.

Farm advisers have carried on educational campaigns, encouraging the farmers to use limestone on their farms. In Richland county, for example, 300 carloads of limestone were spread over the farms. The farm bureau handled the orders for 229 cars. This method of improving the soil is rapidly increasing. Before limestone was used on the land little clover and other legumes could be grown for roughage on many of these farms.

"The live stock farmers were trying to grow animals economically on feed not adapted to their particular needs," said H. B. Piper, farm adviser of Richland county. "Dairymen were trying to produce milk and fat on red top as the roughage. Grain farmers and orchardists were seriously handicapped by the low content of organic matter and the nitrogen in the soil. Orchard owners were paying $100 a ton for nitrate and $2 a ton for stockyard manure, primarily because their soil was not in condition to grow legumes—it needed lime."

As a result of the work of bureau men trainloads of limestone have been hauled into Richland and other counties during the last few years. As a result farmers are feeling encouraged and are making a noise about everything in Egypt. They are not confining their stories to great development in the production of their crops, but tell about their dairy cows, oil and gas fields, coal mines, clays, shale deposits and parks.

It is claimed that many of the large tracts of land in Egypt cannot be surpassed in the production of nuts such as pecans, walnuts, and hickory nuts.

"But Egypt is greatest in its fruit production," says J. P. Gilbert, of Carbondale, secretary of the local development association. "From Effingham to Cairo and from Cairo to East St. Louis large areas are devoted to peach, apple, and pear orchards.

"Nature gave us a splendid fruit soil, a location not surpassed, and climate with length of season and sunlight sufficient to give our apples the texture, flavor, and color most desired, and if our apples were half as well advertised as the California products we could back their apples off the market."

Copper Production and Phosphate Fertilizer Manufacture

THE ANACONDA COPPER MINING CO., Anaconda, Mont., will begin soon the quantity production of its super-phosphate fertilizer which, containing 48 per cent. of available phosphoric acid, which is about three times the amount present in the ordinary eastern-made fertilizer, will permit such absorption of cost of long freight haul as will make possible encroachment on the southeastern and southern markets which consume the bulk of fertilizers used in the United States, to say nothing of its domination of the western field.

Since its organization, up to and including June 30, 1920, the company has paid $170,110,625 in dividends. In all probability these dividend disbursements exceed those of any other mining company in the world.—"Chemical Age."

General Market News

Headquarters of Sand and Gravel Producers to Move to Washington, D. C.

ANNOUNCEMENT has been recently made by E. Guy Sutton, business manager of the National Association of Sand and Gravel Producers that the executive offices of the Association will be moved to Washington, D. C., from Indianapolis, Ind., where the offices are now located. The transfer is expected to be completed by December 1.

Mr. Sutton is also secretary of the Indiana Sand and Gravel Producers Association, but it is understood he will relinquish this position and in all probability R. C. Yeoman, who has been engineer for the Indiana Association will be asked to assume the duties of secretary. It is said the Indiana Association will maintain its suite of rooms now occupied by both associations on the fifth floor of the City Trust Co. building.

A definite announcement will be made later when the official move has been completed, but for the present and until the announcement is made, all mail should be directed as formerly.

Government Tests Give Slag High Rank as Aggregate

TESTS MADE IN 1916 AND 1917 by the United States Bureau of Standards on the value of slags for fine and coarse aggregate have recently been reported. The concrete so made seems to be of an equal strength with concrete made from ordinary gravel. In the tests concrete of satisfactory local sand and gravel was made at the same time of the same cement and mix as the concrete using crushed slag furnished by three commercial companies. The consistency in all the concretes was the same as judged by eye.

The slag was crushed to coarse and medium sizes, the former being fairly uniformly graded from ¼ to 1½-in. openings, through the larger of which 100 per cent passed, the latter being all through a ½-in. screen, 57.4 per cent through a ¼-in., and 6.2 per cent through a 0.85-in. screen, these figures of course being for only one of the specimens and being merely typical.

The weight of the gravel was approximately 100 lb. per cubic foot, while the slag was between 70 and 85. The various slags had a sulphide sulphur content varying between 0.04 and 1.43 per cent. The strength of the various specimens varied according to the different times and the different mixtures of which they were made, but quite uniformly the crushed slag aggregate made stronger concrete than the Potomac gravel aggregate.

The conclusions of the bureau are as follows: Crushed slag as a coarse aggregate produced concrete of as high a strength as gravel. The tests were not extensive enough to determine the durability of the slag, but to the extent of the tests there were no signs of disintegration due to the sulphide sulphur or other causes. Slag sand, because of its lack of fine material, does not produce easily workable concrete when used as a fine aggregate. If it must be used its working qualities can probably be improved by the addition of small amounts of fine sea sand, hydrated lime or other fine material. Provisions in specifications for slag aggregate calling for a maximum sulphide sulphur content of 1.5 per cent and a minimum weight per cubic foot of 70 lb. are tentatively recommended.

New South Dakota Granite Quarry Opened

THE BLACK HILLS region of South Dakota is said to be one of the richest in the world in its assortment of useful minerals. Limestone, gypsum and clay are found there in abundance, and development of these deposits is rapidly progressing. The most recent addition to the building material producers' fraternity of Rapid City, in the heart of the Black Hills, is the Golden Rule Granite Co., of which Clarence H. Langdale is president and general manager, Richard P. Langdale, vice-president, and Roger W. Foye, secretary and treasurer.

This company has acquired several acres of quarry property, known as the Double Echo Quarry, at Huron, 16 miles from Rapid City on the Black Hills and Western R. R. The company has had E. A. Todd, a Vermont granite quarry expert, inspect and report upon this property.

Mr. Todd reports the granite to be a dark blue color, with small crystals and fine grained, and that examination of the quarry bed showed it to be in position and with grain running in the proper direction for easy working conditions. He considered it a fine material for monumental stone. It has been given the name of "dark pearl granite."

The company intends to erect a plant at once for finishing monumental and building granite and will also install a modern crushing plant to utilize waste and offfall granite. Granite from this quarry has already been extensively used in Rapid City and vicinity by monument builders.

Chicago Road-Building Exhibit in February

REPRESENTATIVES of fifteen industries identified with highway construction held a meeting at the Automobile Club of America, New York City, October 22. The purpose of the meeting was to complete the organization of an advisory committee of manufacturers to co-operate with the American Road Builders' Association in holding a great exposition of highway equipment and materials in connection with the Association's annual convention, which will be held at the Coliseum, Chicago, during the week of February 7 next.

The industries represented at the forthcoming exposition will include the sand and gravel industry; crushed stone; Portland cement; asphalt and oil; tar; granite block; paving brick; slag; road-building machinery; quarrying machinery; excavating machinery; trucks; tractors and trailors; concrete mixers; engineering instruments and explosives.

An executive committee to represent the producers and manufacturers was appointed, consisting of J. E. Pennybacker of the Asphalt Association; B. H. Wait of the Portland Cement Association; W. T. Chollar of the Lakewood Engineering Co.; D. C. Fenner of the International Motor Truck Co., and P. P. Sharples of the Barrett Co. A Chicago committee was also appointed, with S. F. Beatty of the Austin-Western Road Machinery Co., as chairman.

Texas Sand and Gravel Producers Meet in Waco, Texas

THE SAND AND GRAVEL PRODUCERS of Texas met in Waco on Nov. 6 for the purpose of organizing a State Association. This meeting was held under the auspices of the National Association of Sand and Gravel Producers and was attended by V. O. Johnston and E. Guy Sutton, president and business manager, respectively, of the National Association.

In the October 23 issue of ROCK PRODUCTS it was stated that at a meeting of sand and gravel producers held in Dallas, Texas, on October 13, V. O. Johnston was elected president and E. Guy Sutton, business manager of the Texas Sand and Gravel Producers Association. This was erroneous in that the meeting was merely to take steps to effect a state association with the aid of the producers present at the previous meetings in San Antonio and Houston. Naturally Mr. Johnston and Mr. Sutton will not hold office in the Texas Association.

News of the Industry

Incorporations

I. N. Conner, of Vaucluse, Va., is about to construct a lime kiln at Cedar Creek, Va.

The Teare Limestone Co., Cleveland, Ohio, has been incorporated for $25,000 by C. W. Bailey and J. R. Cowell, both of Cleveland.

The Orsco Building Material Co. has been incorporated in Omaha, Neb., with a capital of $300,000, by H. M. Orschel, 711 S. 11th St.

The Blue Ridge Slate Corp. has been organized in Esmont, Va., with the election of Thomas B. Gay as president, and Whiting C. Faulkner as secretary.

The Collins Granite Co. has been incorporated in Danville, Va., with a capital stock of $200,000. Geo. R. Collins is president, and A. F. Patton is ssecretary.

The Rockville Granite Co. has been incorporated in Cold Spring, Minn., with a capital stock of $200,000, by Nicholas C. Wenner, and P. H. Alexander.

The General Wall Board Co., Wilmington, Del., has been incorporated with a capital of $200,000 to manufacture and sell plaster board, partition blocks, etc.

The Chestnut Sand & Gravel Co. has been incorporated in Pikeville, Ky., with a capital stock of $10,000, by Virgil Prose, J. M. Johnson and R. B. Wallen.

The Cisco Clay & Stone Co. has been organized in Cisco, Tex., with a capital stock of $250,000, to manufacture face brick, stoneware and porcelain mixtures.

The Johnston Sand & Shipping Co., Johnstown, Penn., has been incorporated for $30,000 by Garner M. Woodhead, C. F. Crossan, M. M. Bequith, all of Johnstown.

The Seiler Guaranteed Roofing Co., Baltimore, Ind., has been organized with a capital of $25,000 to manufacture roofing specialties of various kinds. The directors are Max A., Albert, and Henry A. Seiler.

The Empire Gypsum Co., Rochester, N. Y., has been incorporated for $405,000 to mine and quarry gypsum rock and manufacture gypsum products. The incorporator is A. A. Wolf, 593 Park Ave., Rochester.

Interstate Plaster Board Co., Newark, N. J., has been organized with a capital of $50,000 to manufacture plaster board and a general line of fireproofing building materials. David Armm and David Schiffman head the firm.

The Fi Board Manufacturing Co., Buffalo, N. Y., has been incorporated with $500,000 capital to manufacture building materials from flax, straw, cement, etc. The incorporator is J. H. Gaffrey, 20 Junior Ave., Buffalo.

The Volusia Coquina Rock Co. has been organized in Volusia, Fla., with a capital of $75,000, with W. S. Bowden, of New Smyrna, Fla., as president; J. M. Clark, Bridgend, Fla., vice-president; and F. S. Myer, Volusia, secretary and treasurer.

The Emeralite Surfacing Products Co. has been incorporated in Minneapolis, Minn., with a capital of $50,000, by Silas M. Ford, 1120 E. 7th St., St. Paul; W. Ed. Nelson, 1822 Mt. Curve Ave., Minneapolis, and others, for the purpose of quarrying and crushing stone.

The Western Gravel & Supply Co., Peru, Ind., has filed articles of incorporation with the Secretary of State in Indiana. The company is capitalized at $50,000 and will do a sand and gravel and construction business. The directors are David C. Hay, Albert J. Schini, Charles T. Markle, William A. Swartz and Lewis B. Chalkley.

The Toltec Lime Co., Albuquerque, N. M., has filed articles of incorporation. The company's capitalization is $100,000, divided into 100,000 shares at $1 each, and it begins business with $3,000 subscribed. The incorporators are Harry Leonard, Albuquerque, 500 shares; G. E. Gray, El Paso, 500; G. H. Freidenbloom, Albuquerque, 2,000.

The Independent Phosphate Mining Co., Charleston, S. C., has been chartered. The capital stock is $50,000. The company is authorized to manufacture chemicals, acids and fertilizer and to carry on trade therein, and to mine and dig for rock and earth and other materials. M. M. Hutchinson is president, P. H. Seabrook, Jr., is secretary and treasurer.

The Gray-Knox Marble Co., of Knoxville, Tenn., has increased its capital stock from $200,000 to $500,000.

Moses Bigelow, 154 Nassau St., New York, proposes the development of a 400 acre tract of limestone in Virginia.

The Sand & Supply Co. has been incorporated in Winston-Salem, N. C., with a capital of $50,000, by Howard W. Gano, M. W. Gano and E. K. Hahn.

The Kokomo Sand and Gravel Co., Kokomo, Ind., has been incorporated for $10,000. The incorporators are Walter Dixon, John Harbaugh and Jacob Bergman, all of Kokomo. It is announced operations will be started soon at the gravel pit near the Elwood Haynes property near the city park, Kokomo.

The Sandstone Quarries Co., Minneapolis, Minn., has been incorporated with a capital stock of $100,000, for the purpose of quarrying and manufacturing stone for buildings. John A. Smith, of 423 E. 16th St., Minneapolis, and Wm. Penn, 1150 Plymouth building, Minneapolis, are among the incorporators.

Cement

The Caronlia Portland Cement Co., New Orleans, La., suffered a loss of about $100,000 when its warehouse and two adjacent buildings were destroyed by fire recently.

The Security Cement & Lime Co., of Security, Md., of which A. Loring Cover is president, will increase capacity of its plant at Security near Hagerstown, Md., from 3,000 to 6,000 barrels of Portland cement, and will probably also double the capacity of the lime plant in Berkeley, W. Va.

The Bessemer Limestone & Cement Co., Youngstown, O., has started the operation of one-third of the kiln capacity of its new cement plant at Bessemer, Pa., and expects to have its entire capacity engaged in production by the first of the year. Buyers are placing contracts at current prices for next year's delivery.

The National Portland Cement Co., it is announced, has been formed with Sir John Monashas provisional Chairman of Directors. The works will be on Maria Island, off the south-east coast of Tasmania, where limestone deposits estimated to extend to many millions of tons rise in the form of cliffs from the seashore. The first unit of machinery will be capable of producing over 300,000 tons of the highest grade cement per year.

The Atlas Portland Cement Co., Northampton, Pa., has resumed operations at its local No. 2 mill. The plant has been closed down for some time past. The local No. 4 mill has been in continuous operation. The company has been making some heavy shipments of late, and a good number of cars are being obtained from the railroads for this purpose. There are little if any reserve stocks now at this plant and the material is being shipped as fast as production will permit.

The Phoenix Portland Cement Co., Nazareth, Pa., is installing in its plant four large compartment tube mills in the finish end to replace a battery of old ball and tube mills, some of which have been in operation for 20 years. These mills will be driven by individual motor, 400 H. P. each, connected to the pinion shaft of the mills with Link-Belt silent chain drives. This new installation will have a capacity of over 100,000 barrels of cement per month, and will be one of the most modern installations in the country when completed. Last year the company made extensive improvements and additions to its raw grinding department and coal mill, which have proven very efficient in every respect.

Sand and Gravel

Sidney McLaughlin has opened a gravel pit at McLaughlin, S. D.

Lincoln, Ill.—While the receipt of cars for shipment of gravel have been running a little short, owing to the priority of coal mine rights in coal cars, the Lincoln Sand and Gravel Co. has been making some improvements at its plant south of the city. The improvements relate to the flood waters expected in the spring and which usually delay operations for weeks. S. R. McNeil, in charge of the plant, is now engaged in raising the tracks out at the pits to a much higher level. When he finishes the present work of track elevation he will have it three feet higher than when he found it, at least in the lower parts of the system especially susceptible to injury from high waters. This elevation will bring the track above the high water mark. In addition, a dike or dam is being built part of the way across the east side of the big pit in which the pumps are working to divert the waterflow from the working pit to the smaller ones lower down. Many weeks of operation have been lost heretofore in the spring when cars were available, due to the high water, and a day or two of working time in the spring will amply repay for the improvements being made now.

Concrete Products

The Compo Stone Co., Portland, Ore., F. H. Christiansen, manager, expects to establish plants soon at San Francisco and Los Angeles.

The Hampton Brick & Tile Co., Hampton, Ia., has been incorporated for $500,000 to manufacture brick and tile by C. F. Osbore, Pres.; E. G. Dunn, Vice-Pres.; J. C. Power, Secy-Treas.

The Keswick Brick & Tile Co., Keswick, Ia., has been incorporated for $10,000 to manufacture brick and tile by C. D. Harlan, Pres.; Ernest Ewald, First Vice-Pres.; J. E. Lane, Second Vice-Pres.; John Burkenbine, Secy., and Del Higgins, Treas.

The Ramboe Stone Co., Albany, N. Y., is opening temporary quarters in Twoli St., Albany. The quarters will be used until a modern plant is built in the spring. The new company is incorporated for $50,000 and is headed by Frederick W. Siberkraus. Daniel Colmar is vice-president and Stephen Colmar, secretary and treasurer. The capacity output of the plant will be about 30,000 tiles a day. All the raw materials necessary for the manufacture of the company's products are close to the factory. The company has obtained control of large sand and gravel banks. When the new plant is in operation the corporation will be in a position to manufacture all kinds of artificial stone, garden furniture and brick.

The Picabbs Tile Co., Danville, Ind., has been organized with a capital of $100,000 to engage in the manufacture of cement building tile. The following officers are at the head of the new concern: Carl Rost, capitalist of Indianapolis, president; W. E. Carter, electrical engineer, of Avon, vice-president; F. Brewer Hadley, Danville merchant, secretary; and H. C. Hadley, former Danville merchant and farmer, treasurer. The company owns a five-acre tract on the White River boulevard, and has under construction a new factory that will be the most modern cement products factory in Indiana. The project has the endorsement of the Indianapolis Building Association and also the Chamber of Commerce. E. G. Spink, the largest builder of apartment houses in the middle west, is one of the largest stockholders.

Personals

Zenas W. Carter has resigned as manager of the Material Handling Machinery Manufacturers' Association to accept the position of assistant to the president of the F. C. Austin Corp.

B. F. Bickel has resigned as superintendent of the Red Buttes plant of the Colorado Portland Cement Co. to become general manager of the Laramie Cement Plaster Co.'s plant at Cheyenne, Wyo. L. L. Downing of the Acme Cement Plaster Co. takes Mr. Bickel's place at the Red Buttes Portland cement plant.

Messrs. George L. Van Moppes and Joel L. Van Moppes, representing the L. M. Van Moppes Diamond Company, of 665-671 Broad Street, Newark, New Jersey, sailed on the S. S. Rotterdam, Saturday, November 6th, to visit the principal European diamond markets for the purpose of purchasing rough diamonds and industrial diamond bortz for their firm.

John Rice, president of the General Crushed Stone Co., Easton, Penn., and president of the National Crushed Stone Association, has been made a member of Committees C-9 on concrete aggregates, and D-4 on road materials of the American Society for Testing Materials. Mr. Rice represents the crushed stone industry on these committees as a producer.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plants for Sale

FOR SALE

257 acres of land, underlaid with fine quality limestone suitable for high-grade hydrated lime, agricultural limestone, flux, etc. Water running through property. Located near Warwick, New York. Close to railroad.

Fuller-Lehigh Company
Fullerton, Pa.

FOR SALE

Silica Sand Crushing Plant, completely equipped, capacity 300 tons per day, 55 ft. Ledge white and buff silica sandstone. This plant is in first-class condition, has been in operation 10 years. Completed a new and up-to-date plant about a year ago. Have orders for entire output of plant, has operated winter and summer for past 10 years; best quality steel moulding sand; situated in Ohio; is a money-maker, and if sold quick will be sold at a bargain to someone interested in silica sand. Address

Box 1442 Care Rock Products

FOR SALE

Complete Ground Limestone Crushing Plant with Sturtevant Mill, Screens, Conveyors, etc.

EMPIRE LIMESTONE CO.
BUFFALO, N. Y.

Help Wanted

WANTED

Man thoroughly capable of running a lime burning and crushing plant in Massachusetts. Apply, with particulars, to

Box 1439 Care of Rock Products

WANTED

Experienced Kiln Burners. Kilns 8x100 ft. and firing with fuel oil, 8-hour shift, dry process, pay satisfactory. Communicate with

Riverside Portland Cement Co.
Riverside, California

WANTED

Engineer capable of handling small Ingersoll Rock Chanelling machine. Wire

Siems, Helmers & Schaffner,
514 Guardian Life Bldg. St. Paul, Minnesota

Situations Wanted

SUPERINTENDENT

With practical experience and general knowledge of quarrying desires a position with a reputable company, no objection to location. References. Address

Box 1440 Care Rock Products

CRUSHING ENGINEER

wishes to correspond with some good crushing concern which would be interested in a man to take full charge of operation. Address

Box 1441 Care Rock Products

Miscellaneous

WANTED

Manufacturers' Agents and Mechanical Equipment Salesmen calling on quarries, gravel, sand and crushed stone dealers, highway officials, contractors, manufacturers, power plants, etc., to handle on a liberal commission basis, exclusively or as a side line, a modern line of Portable Conveyors. Good territories open.

General Conveyor & Mfg. Co.
320 South Third St., St. Louis, Mo.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

FOR RENT

Two 3½-ton dump trucks suitable for gravel hauling. Starting November first.

BOOTH & OLSON
Sioux City, Ia.

FOR SALE

2—No. 18 Gates K Gyratory Crushers with elevators and screen; complete; first class; immediate delivery. Also twenty other sizes.

J. F. DONAHOO CO.
Birmingham, Ala.

For 48 pages of unusually good bargains in

CRUSHERS

Compressors, Boilers, Hoists, Rails, Cars, Locomotives, Quarry Equipment, etc.
Write for our Latest Big Bulletin.

ZELNICKER in ST. LOUIS

For prompt and satisfactory results in buying or selling a plant securing help or a position, use the Classified Department of ROCK PRODUCTS

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.

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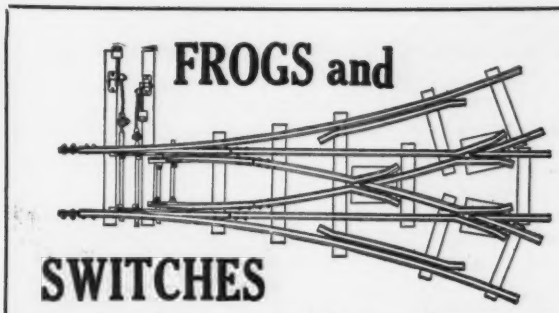

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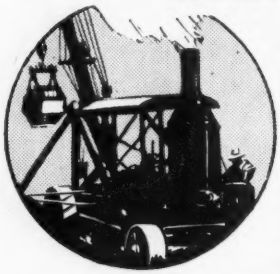

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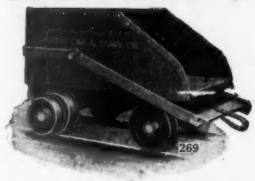

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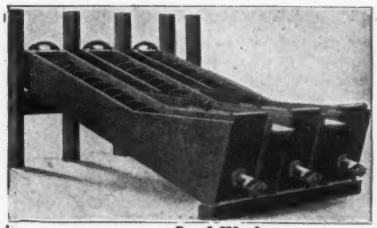

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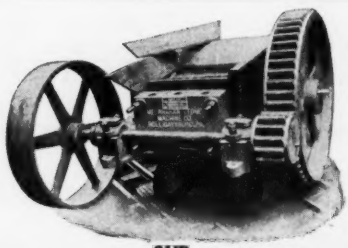

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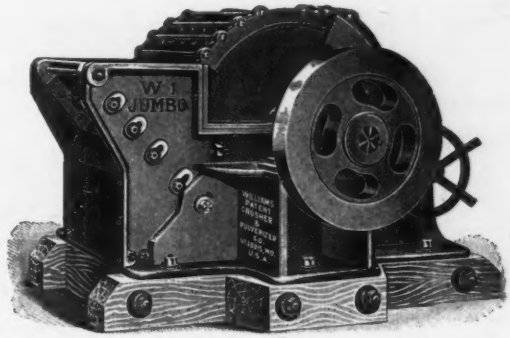

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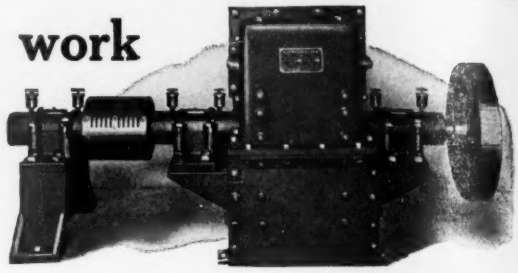

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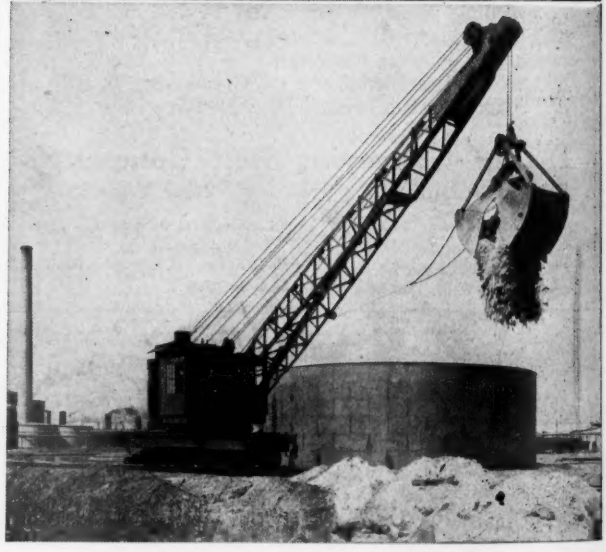

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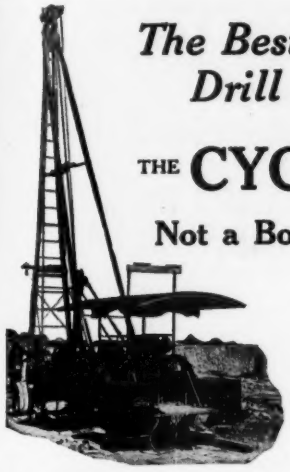

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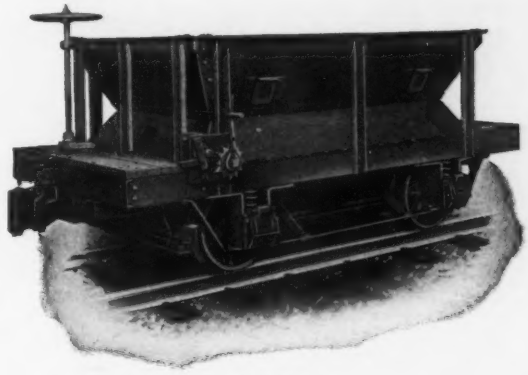

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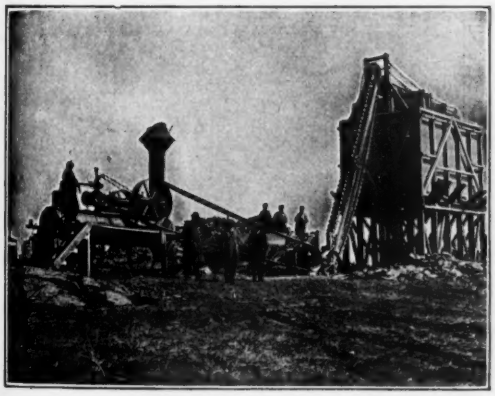

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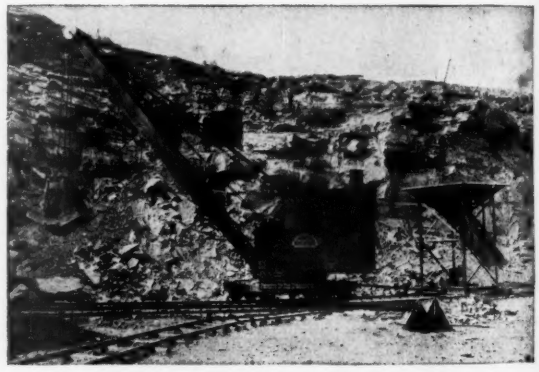

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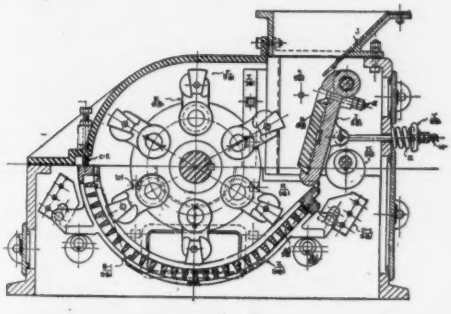

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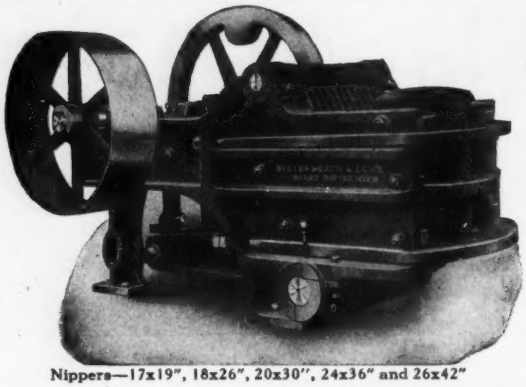
120 Broadway **New York**

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.

ELEVATOR BUCKETS
PLAIN AND PERFORATED
General Sheet and Light Structural Work
Hendrick Mfg. Co.
CARBONDALE, PA.
New York Office, 30 Church Street



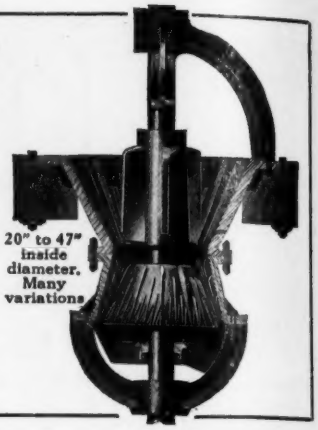
Nippers—17x19", 18x26", 20x30", 24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime



20" to 47" inside diameter. Many variations.

Butterworth & Lowe

17 Huron St. Grand Rapids, Mich.

PERFORATED STEEL SCREENS

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania

Many Notable Improvements Characterize THE "American" Gearless Blast-Hole Drill

While the normal speed of drilling is 50 strokes a minute, this machine will jump the tools smoothly at 60 strokes, handling with ease a 4-in. diameter by 20-ft. length drill stem equipped with bit and socket weighing from 1100 to 1200 lbs. and drilling 5¾-in. or 6-in. holes.

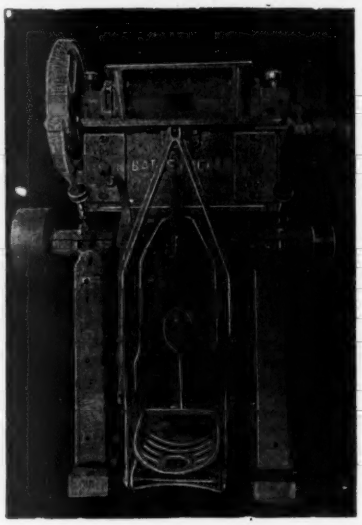
The spudding beam is attached to the crank in such manner that it gives a quick, hard stroke of drill at a speed of 50 or 60 r. p. m., with a minimum of whipping of cable.

No clutches on the machine; the crank is keyed fast to the crank shaft, and the tools are always the full length of the stroke off the bottom when stopping, permitting them to start on the down stroke with engine or motor at full speed without backing up.

Description on Request

The American Well Works Aurora, Illinois

BATES BAG FILLING MACHINE



will reduce your costs in filling bags with pulverized limestone, ground phosphate, gypsum, stucco, cement, Fuller's earth, paint fillers and other pulverized rock products.

Outstanding features of BATES Bag Filling Machines are:

Less Labor
Greater Output
Reduced Cost

Made in four sizes—single tube, two tube, three tube and four tube—respective capacities are 75, 150, 225 and 300 ton per day.

Send for Our Catalog

Bates Valve Bag Company

7310 South Chicago Ave. Chicago, Ill.

ERIE Steam-Shovel owned by Jackson-Bangor Slate Co., Pen Argyl, Pa.

"Very Economical"

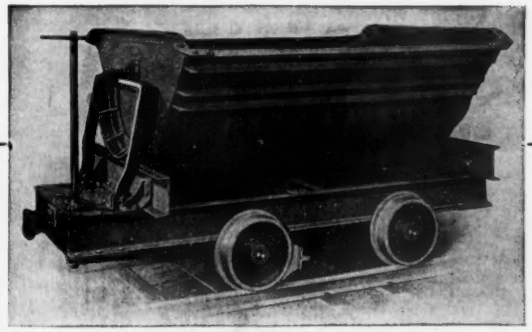
"During the past year we have moved approximately 50,000 cubic yards of slate shale with our ERIE Shovel. It is a wonderful machine, ideal for our work, as it is easily moved. We find it very economical and inexpensive. We are very much pleased with our investment." *N. M. Male, Sec'y, JACKSON-BANGOR SLATE CO., Pen Argyl, Pa.*

The ERIE Shovel is easy to operate, and very speedy. It is built with extra strength all the way through, and gives steady service in hard rock loading. Let us send you full details about the ERIE Shovel, and what it will do. Write for a copy of Bulletin P.

Serves as Steam-Shovel or Crane (Clamshell)

BALL ENGINE CO., Erie, Pa.
Builders of ERIE Steam-Shovels and Locomotive Cranes

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.



More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

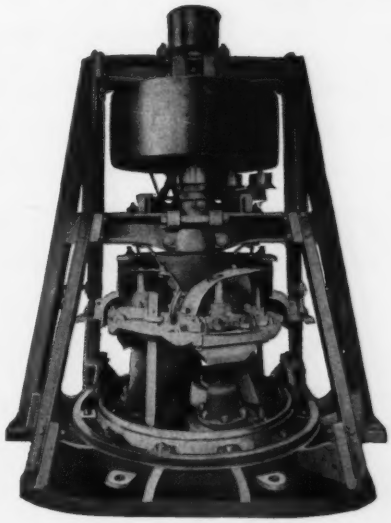
Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

BRADLEY

3 Roll Mill

The ideal pulverizer for the agricultural limestone producer who desires a uniformly finely ground, finished product. Produces a fine material cheaper than other types of machines that grind coarser.



Why Not Use the Best?

The Bradley 3-Roll Pulverizer insures maximum output at minimum cost.

A self-contained mill pulverizing rock from 1 in. to 70% through 100 mesh or finer in single operation.

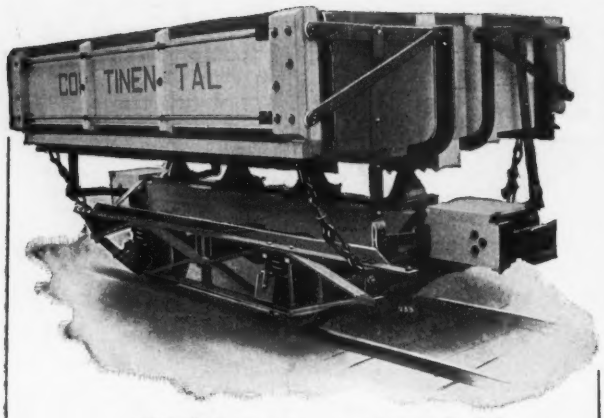
Simple to operate. Low maintenance cost.

A real mill for agricultural use.

Bradley Pulverizer Co.

Boston London Works, Allentown, Pa.

Manufacturers Giant Griffin and Bradley Hercules Mills



"Built better to wear longer"

Did It Ever Occur to You—

That the basic construction of Continental Dump Cars was right, and that we would not receive the repeat orders that we do unless this basic construction was right?

Don't buy disappointments—

BUY CONTINENTALS

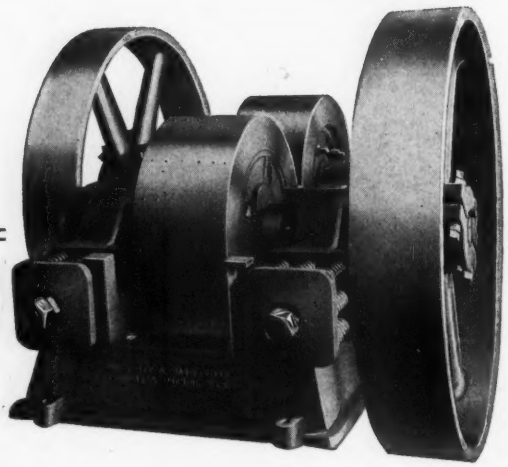
Continental Car Co. of America, Inc.
MAIN OFFICE AND WORKS
LOUISVILLE, KENTUCKY

HETTRICK
CANVAS BELTING

Every piece of Hettrick Canvas Belting that leaves our plant must be worthy of the seal it bears, and the careful inspection it receives insures the user of a high grade, full weight belt. Quality is built right into every foot of Hettrick Belting.

THE HETTRICK MFG. CO.
TOLEDO, OHIO

Service Quality Satisfaction



When you are in the market for Transmission Equipment, Screens, Elevator Buckets or Crushers, and want the best that can be had irrepective of price.

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WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS
WEBB CITY, MISSOURI

"Perfect" Concrete Power Block Machine

Also Hand and Power Brick Machines
Hand Block Machines
Well, Cistern and Silo Molds

C. S. WERT, Inventor and Patentee

GEARLESS—NOISELESS

This Power Block Machine, equipped with a one-horse power motor or 2½ H.P. gas engine, and three men will manufacture 1,000 blocks in ten hours.

Earn $100 daily with this machine. The opportunity to get in on the ground floor of an industry that is growing with tremendous speed is here.

Get the "Perfect" Line of Concrete Machines and start now.

Manufactured by

The Wert Mfg. Co.
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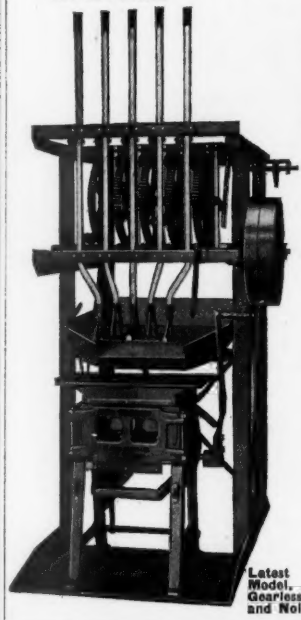
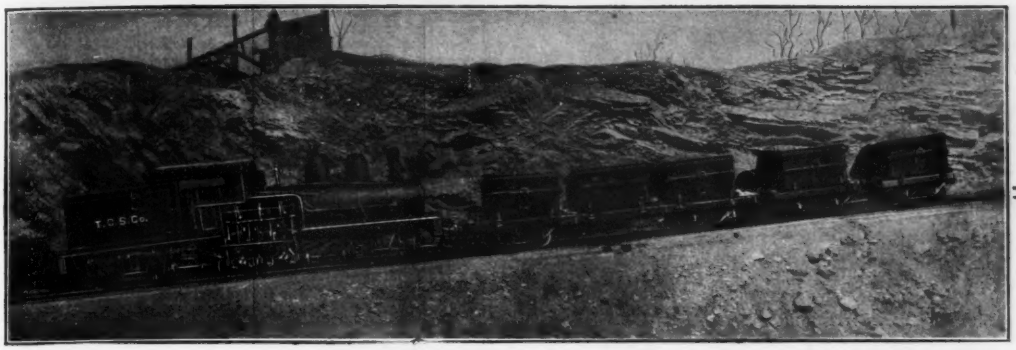
Chicago


Latest Model, Gearless and Noiseless



Keep Them Moving

"Shay" engines are especially adapted to uneven track.

Every wheel is a driver—there is no slipping at bad spots as with a rod engine.

"Shays" keep your rock moving, so that there is uninterrupted output.

The kind of service they give is the kind that produces largest net profits.

LIMA LOCOMOTIVE WORKS, Inc.

LIMA, OHIO **30 Church St., New York**

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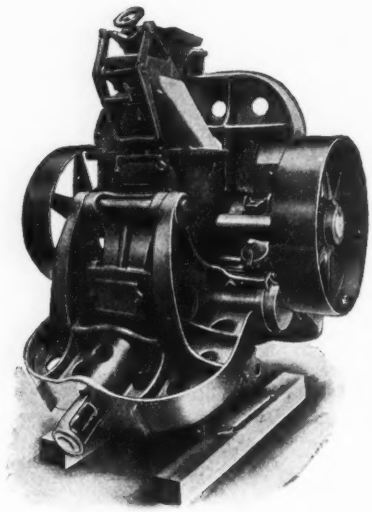
Cordeau-Bickford Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting, where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

The Ensign-Bickford Co., Simsbury, Conn.

Established 1836 **Original Makers of Safety Fuse**



MAXECON MILL

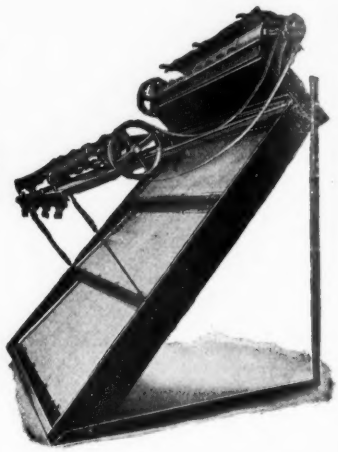
Preliminary Grinder for Tube Mills

LIMESTONE .....20 to 40 Mesh
CEMENT CLINKER .....20 to 60 Mesh

MAXECON MILL

PERFECTION SEPARATOR

The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.



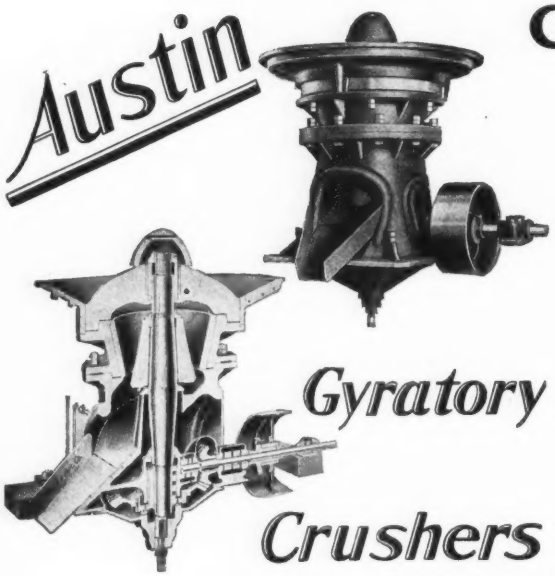
It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

Drop us a line **We will be glad to tell you about it**

Kent Mill Company

10 Rapelyea Street **BROOKLYN, N. Y.**

Two Factors in Crusher Operation



In crushers there are two fundamental requirements necessary for satisfactory operation—**ruggedness** and **output.** Austin Gyratory Crushers have both.

Strength to stand up under severe shocks and strains, assuring long life—and large capacity, the ability to turn out the greatest amount of work with least expenditure of time and horsepower.

These profit making factors are possible only with correct design and the experience gained by years of successful manufacture.

In Austin Gyratory Crushers you get every crusher advantage plus six exclusive features found only in **Austin.**

Write today for Catalog 28.

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OHIO
Locomotive Cranes

Send for this booklet—It will tell you the complete story of the incomparable construction of the Ohio Locomotive Crane, of the 90 per cent Basic Open Hearth Steel Castings, of the simplicity of design and its accessibility: of the wide variety of types operated by steam, electricity compressed air, oil or gasoline engines. In it there are many pictures of the "OHIO" crane on the job with blue prints and technical descriptions for your engineering department. If you are interested in cranes you will be interested in this booklet.

THE OHIO LOCOMOTIVE CRANE COMPANY
BUCYRUS, OHIO, U. S. A.

AMSCO
"THE TOUGHEST STEEL KNOWN"

Clark Reversible Dipper Tooth
(Patented)

A Heavy Duty Two-part Tooth

THE Clark reversible dipper tooth meets the most severe digging conditions, such as are encountered by the large revolving shovels in stripping the over-burden of coal, ore, etc. Likewise, it does excellent work in ordinary excavating.

The base or shank of the AMSCO Manganese Clark tooth for the large revolving stripping shovel is of the "I" beam construction, such as is shown above. This is particularly recommended for hard service, as it secures maximum strength with minimum weight.

When the Clark points, after long usage have worn to such an extent as to reduce efficiency, they can be reversed, thereby providing a new cutting edge. Only one bolt must be removed to reverse or renew the points. The bolt as you will note from the illustration is a wedge type bolt and is set parallel to the dipper lip. The nut is protected by bosses cast on the base to prevent it from shearing off.

Working under various conditions throughout the country, the AMSCO Manganese Clark reversible tooth has been considered an eminently satisfactory and economical design. It is made entirely of AMSCO Manganese Steel—consequently long life is assured.

Write for information regarding attractive free exchange proposition.

American Manganese Steel Company
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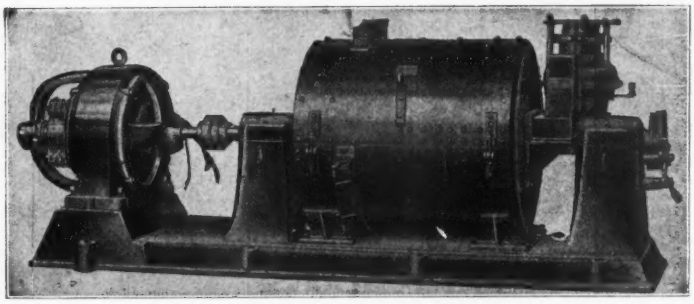
ABSOLUTE SAFETY IN BURNING PULVERIZED COAL

By the Aero System there is no coal pulverized except for instant use. As conditions call for the supply so does the Aero produce the proper quantity. The hazard attendant upon storage of the coal powder is entirely eliminated.

There is nothing between the coal bunker and the furnace except the Aero, its motor and a plain pipe connection. Another feature with the Aero—if the coal supply is sheltered from rain and snow no artificial drying is necessary. Neither must the coal be of a very high grade—low cost slack coal can be made to yield its last B. T. U.

The AERO PULVERIZER



is designed as a complete unit for one furnace. They are built in five standard sizes ranging in capacity from 600 lbs. to 5,000 lbs. of coal per hour. Dust-proof and strongly built. All parts susceptible to wear are easy of access.

BACKED BY THE LONGEST SUCCESSFUL SERVICE

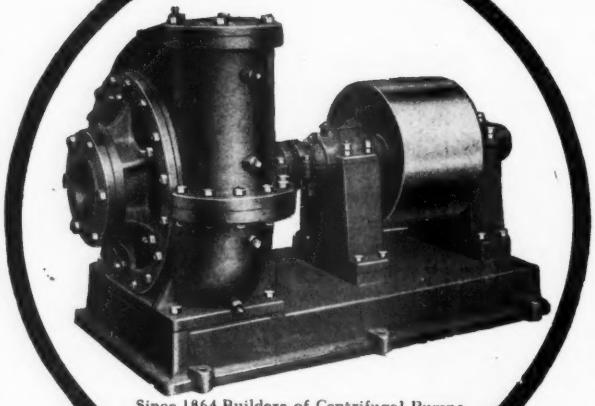
Write for Bulletin

AERO PULVERIZER CO., 120 BROADWAY, NEW YORK

MORRIS PUMPS

Hydraulic suction dredging is the most economical method of handling sand and gravel because the material is raised and delivered in one operation.

Morris Pumps operate with a minimum of power and repair. They are built in shops equipped with the most modern tools. Shops that have produced over



Since 1864 Builders of Centrifugal Pumps, Hydraulic Dredges, Steam Engines

60,000 pumps in all styles and sizes during the past 56 years.

Our booklet tells you more about pumping. Get it.

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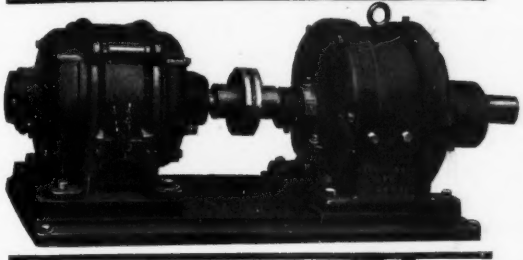
James Speed-Reducing Transmissions



save space and save power. They are compact and easy to install. They are dust-proof and fool-proof. In cement, stone, and lime plants, where space is at a premium, and where dust conditions are unusually severe, James equipment for reducing motor speed appeals to the plant engineer. The power is delivered more economically and with less strain on the motor.

Any reduction of speed from the ratio of 4:1 to 1600:1 can be furnished.

Our engineering service is ready to assist you in definitely solving your problems connected with the economical delivery of power by direct connected motors.

Send for our latest bulletin, No. 7

D. O. James Mfg. Co.
1120 W. Monroe St., Chicago, Ill.

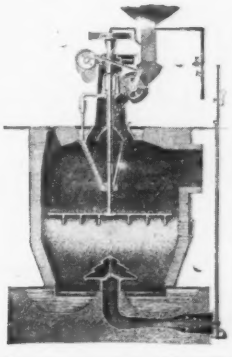
Provide Operating Economy

BRING your gas house up to date with Chapman Producers, or modernize your old producers with Chapman Floating Agitators, Automatic Feed Type. Write for proofs.

Chapman agitators applied to old hand poked producers are saving 70% labor and 20% fuel each day in numerous plants in the steel district. Over 70% of our business is on repeat orders. Let us send you full technical data.

The CHAPMAN ENGINEERING CO.
C&G Division of The COOPER CO.

MT. VERNON, OHIO
11 Broadway, N. Y. Oliver Bldg., Pittsburg



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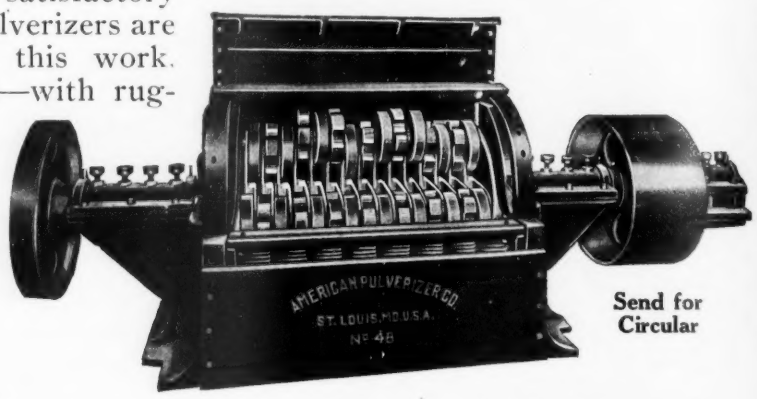
THERE'S GOOD MONEY IN IT!

Start now to meet the increased agricultural demand for ground limestone. The profits are large and the market is far bigger than the supply. Ground limestone answers the same purpose as BURNED lime, yet sells at less than half, leaving a most satisfactory profit. American Ring Pulverizers are earning big returns in this work. They're brutes for work—with ruggedness and POWER, "plus." May we send you full particulars about this business? Just write for our free circular "How to Make Money Grinding Limestone."



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American Pulverizer Co. 18th and Austin Sts. ST. LOUIS, MO.

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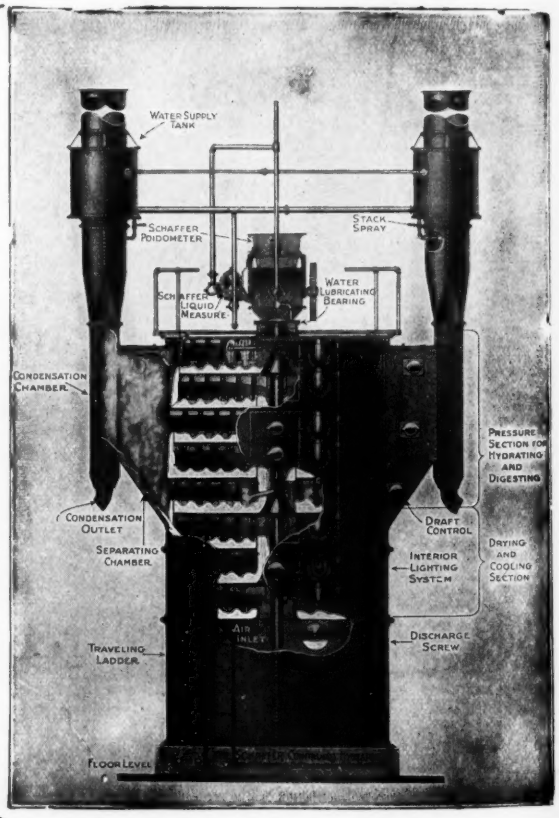
Continuous Lime Hydrators

AUTOMATIC operation delivers lime by **weight**, not volume, to the Schaffer Hydrator. Automatically, water, too, is added in correct proportion—insuring a continuous flow of a superior product.

The flexibility of control enables the use of either high calcium or dolomite lime, while at the same time the automatic operation of Schaffer Hydrators solves the labor problem, as they require but little attention.

Our literature on the Schaffer Hydrator covers all the questions you now have in mind. Write for it at once!



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S-A Gravel Washing and Screening equipment is designed to do the work quickly, thoroughly and with a minimum cost for maintenance. The cost of labor with S-A Gravel Plants is unusually low, because the operation is largely automatic. S-A engineers are at your service—ready to help you—and they thoroughly understand gravel work.

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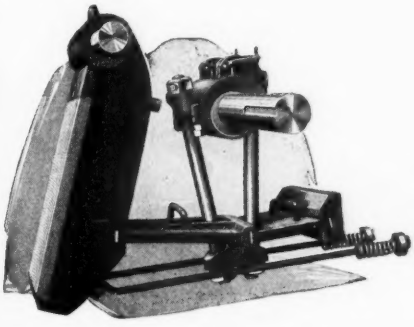

The Lighter but Stronger Pitman
and the
Frictionless Toggle System
Mean 80% Less Friction in

"Bulldog" Jaw Crushers

The Pitman uses two wrought steel rods of *known strength*, in place of an unreliable casting, and the three toggle ends roll on flat steel seats without grinding. These points, as well as the steel-banded frame of unequaled strength and many other exceptional features are fully described in Bulletin R-JX-1.

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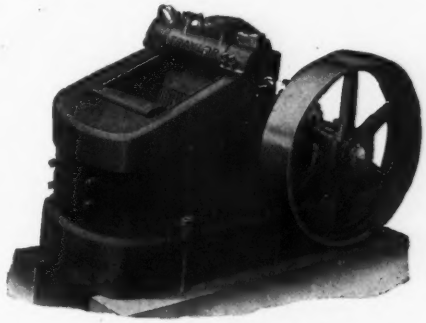

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the conversion of our immense shipyard at Cornwells, Pa., into a plant for the manufacture of Motor Trucks and All Purpose Tractors of a quality equal to the best and which average up with the other older and world known Traylor products.

Traylor Engineering & Mfg. Company
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For Delivery From Stock

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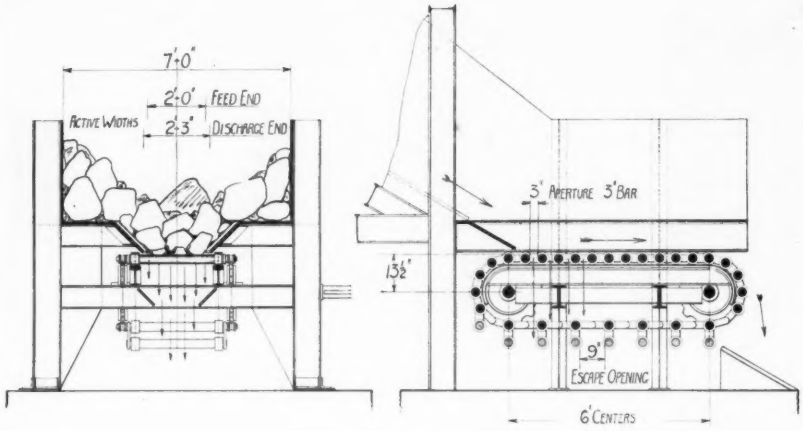

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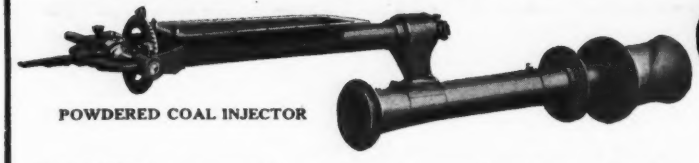

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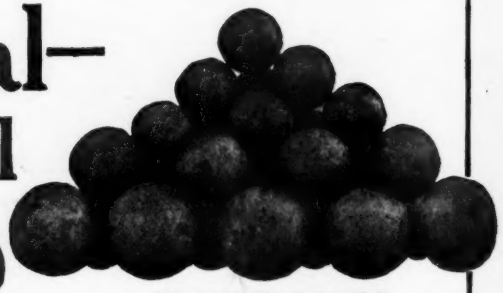

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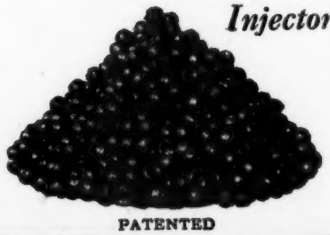

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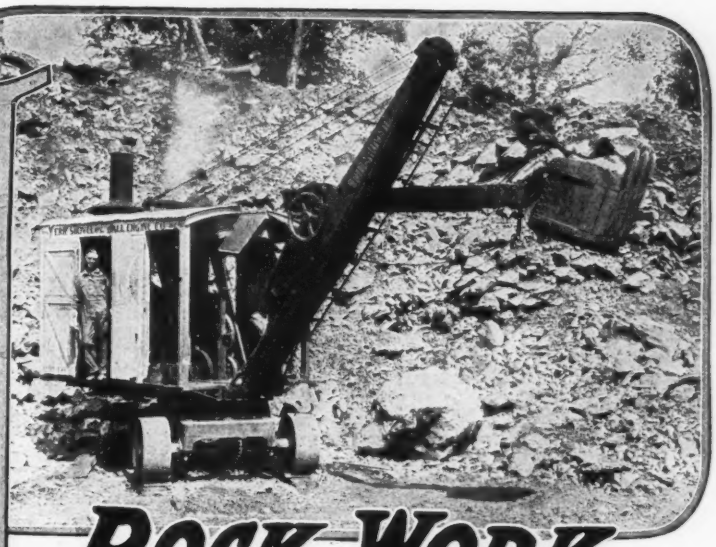

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with a 13 ton Shovel!

Can you get steady, reliable service in hard rock loading, from a steam shovel weighing only 13 tons?

Yes, you can!—the answer comes back to you from quarries throughout the United States, where the "A" ERIE is used.

The above photo shows one of two ERIE Shovels owned by **E. N. Wiegel, of Little Rock, Ark.,** who writes: "We have almost worn out a dipper, having handled during the last six months between 300 and 400 tons of rock per day—but the 'A' ERIE looks and works just like new."

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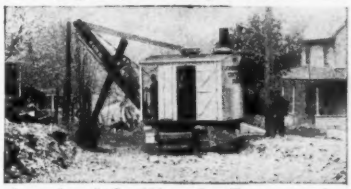

have found the 'A' to do all you say for it, and more."—Johnson & Kearns, DuBois, Pa.

CELLAR EXCAVATION: "We started a basement excavation without any thought of making a record. After working nine hours we were surprised to learn

that the 'A' ERIE had excavated by actual measurement 481 cubic yards. We consider this a remarkable record, as the basement was 16 feet deep."—C. J. Smith, Canton, Ohio.

TRENCH DIGGING: "We have found that our 'A' ERIE will not only dig the trench, but back-fill it at one operation. We have laid the pipe under the

shovel as it moved along. The 'A' is all that we expected and more!"—Bowman Bros. Co., McKeesport, Pa.